This issue of

The Mathematics Teacher

is

dedicated to the memory of

RALEIGH SCHORLING

Third President

of

The National Council of Teachers of Mathematics

1924-25

and

Member of the Board of Directors

1932-34

RALEIGH SCHORLING
1887–1950

THE MATHEMATICS TEACHER

Volume XLIV Number 2

Raleigh Schorling 1887–1950

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By naming the February issue of The Mathematics Teacher the "Schorling Number" the National Council of Teachers of Mathematics is paying tribute to a man who devoted 40 years of his life to the cause of mathematics and was an outstanding leader in the field of education.

Raleigh Schorling was born in Batesville, Indiana on August 15, 1887. He received his elementary and secondary education in that state. He continued his studies in the Indiana State Normal School from which he graduated in 1909. During the next two years he studied at Indiana University and at the University of Michigan receiving the A.B. degree in 1911. He then enrolled at the University of Chicago and was granted the A.M. degree in 1914. Later he entered Columbia University and in 1924 the Ph.D. degree was conferred on him at that institution.

His teaching experience was varied and extensive. From 1904 to 1907 he taught in the public schools of Indiana. He was principal of an Indiana high school during 1907–1908. Next he taught mathematics at Short-ridge High School in Indianapolis. He then joined the University High School faculty at the University of Chicago, but left in 1917 to become principal of the Lincoln Experimental School of Teachers College, Columbia University. From there he went to Ann Arbor, Michigan as principal of the University High School, the University of Michigan. Lastly in 1926 he was appointed Professor of Education, Principal of the University High School, and Supervisor of Student Teaching at the University, a position he held until his sudden and unexpected death on April 22, 1950.

Professor Schorling was an outstanding teacher of mathematics. He possessed unbounded enthusiasm which he was able to pass on to his pupils and colleagues, and gained among his pupils the reputation of being the teacher in whose classes there was no napping. He was particularly interested in and sympathetic with the slow pupils and knew how to bring his teaching down to the level of their ability. At the same time he was keen in identifying pupils of superior ability. He aroused in them genuine interest in the subject and many took all the mathematics they could crowd into their programs and continued the study of the subject in college. Many men and women prominent today in the affairs of adult life gratefully remember the assistance and council he gave them when they were high schools pupils.

His activities as a high school teacher were not limited to his classes. He had a

keen interest in the various clubs and societies, school contests and athletics. His council and advice was greatly appreciated by the pupils and the administrative officers of the school.

Professor Schorling was a born leader and organizer. He was constantly helping pupils organize their entertainments, clubs and contests. In 1913 he was one of the group of Chicago teachers who founded and developed the Men's Mathematics Club which has been a definite influence for improving the teaching of mathematics and is as active today as it was in the early period. During the first three years he was the club's president. In February 1920 he took an active part in the group of teachers which founded the National Council of Teachers of Mathematics. He was the third president from 1924–1925 and served as a director in 1932–1934. *The First Yearbook* of that association was edited by him. Moreover, throughout his busy life he gave also generously his time and energy to the problems of other organizations, especially the Central Association of Science and Mathematics Teachers and the Mathematical Association of America.

During the last three decades a great deal of the work of improving the organization and teaching of mathematics has been done by large committees and commissions.

Professor Schorling was a member of the National Committee on Mathematical Requirements which made its famous report in 1923. He was a member of the Cooperative Committee on Science Teaching which reported in 1941, and of the Committee on Pre-Induction Courses in Mathematics which reported in 1943. He was chairman of the Committee on Post-War Plans, which made three reports, the first two being published in 1944–1945, and the last, known as the *Guidance Pamphlet in Mathematics for High School Students*, being published in 1947.

Perhaps his greatest influence on the teaching of mathematics was exerted by Professor Schorling's books and pamphlets. As early as in 1915 he began his career as an author when he published *Review of High School Mathematics* with W. D. Reeve as co-author. By 1950 his name had appeared on numerous books, pamphlets and texts on mathematics, statistics and student teaching. Most of these were published by the World Book Company, and John R. Clark, Roland R. Smith, Francis G. Lankford, Jr., Mary Potter, and Vera Sanford were co-authors.

With his death at the early age of sixty-two years the cause of mathematics has lost one of its most devoted and active supporters, but his work will be appreciated by the teachers of mathematics for many years to come.

"At the moment, mathematics in the high school is enormously popular. . . . Time and circumstances have played in our favor, but they may not do so a second time. We need to keep a discerning eye on the situation that may exist five years after the war ends. Unless we provide sensible programs (note the plural) in mathematics for all pupils of the secondary schools, each appropriate to the ability and need to be served, the devastating fire of criticism may again be directed at mathematics. At any rate, it should be.

. . . . . .

". . . No one should assume that all is well with the traditional courses. In most schools they are woefully out-of-date as regards both subject matter and method. . . . The unique values of the traditional courses cannot be achieved by a constant gearing down, nor by the inclusion of popular material in a futile effort to meet the mathematical needs of pupils who should not have elected the courses in the first place. The first step in the postwar period is to scrutinize the traditional courses in the light of recommendations that have long been widely approved."—SCHORLING, RALEIGH. "The Need for Cooperative Action in Mathematical Education," *The American Mathematical Monthly*, Vol. 52, April 1945, p. 195.

The Story of My Father

By Ruth Schorling Rickard

When my father spoke of "down home," he meant the old farm in Ripley County, Indiana, where he grew up. Every fall, for many years, we went to the farm for a visit, and there Dad stopped being Professor Raleigh Schorling of the University of Michigan, and became just a boy who was back home.

The snug, white farmhouse at Kammeyer's Corner was once a log cabin and upstairs one can still see where the logs have been plastered over. Dad relaxed there as he never did at any other time. I have a picture of him now, the old swing on the side porch swaying slightly, as he sat puffing a cigar and listening to bits of neighborhood news. In this section of southern Indiana, the old German dialects persist; and much to the chagrin of us children, the family often lapsed into the low German of their childhood when there was anything really interesting to relate! Pretty soon we would hear the metallic whine of the pump as someone drew a pitcher of that incomparable well water, and then Clara would call us into the summer kitchen for one of her bountiful chicken dinners.

Down there, Dad was our boon companion, always ready to fish, look for crawdads, explore the barns, hunt for eggs, walk through the woods, or play cards by the light of a kerosene lamp. Dad was tremendously fond of card games of any kind and excelled at them all within a few minutes of learning the rules. I never saw him misplay a bridge hand.

But my story begins on August 15, 1887, when a baby boy was born in a small Indiana farmhouse to Henry and Caroline Kammeyer Schorling. It is doubtful if his advent meant much more than an additional mouth to feed, to the unsuccessful tenant farmer and his invalid wife. The baby was named Raleigh and when his mother died in May of 1889, the father moved away, leaving Raleigh, a todler nearly two, with the Kammeyer family.

John and Dorothea Kammeyer already had five children of their own when they took in the homeless baby. They were a devoted family and Raleigh always

First Grandson and Namesake,
Robert Raleigh Rickard

thought of the Kammeyers as his parents and spoke of his cousins as brothers and sisters. Since they talked German in the home, Raleigh did not learn English until he was six and started first grade in the little red brick schoolhouse on one corner of the farm. His sister Clara remembers him as a slight youngster, with fair hair and incredibly blue eyes, who loved school, read incessantly, and liked to talk. Most

of the neighborhood boys left school early, but Raleigh graduated from the eighth grade in 1901 and his teacher urged the Kammeyers to send him on to high school.

Dad used to tell later how he worked all that summer on the farm (he began to help at home when he was just big enough to gather eggs), hoping that he would be allowed to go to high school but not daring to ask. Finally came the first morning of school. Dad got up at the usual hour of 4 o'clock, worked until seven, when Father Kammeyer said, "Hitch up the buggy, Raleigh. You can go to high school if you're so set on it." He finished the course in three years, starred on the basketball team, graduated with honors, and in the fall of 1904, barely seventeen years old, Raleigh Schorling took his first teaching position.

The same fine teacher who had insisted that Dad go to high school, now gave destiny another push by urging him to go to college, though no one from that county had gone up to that time. Since the Franklyn Township school, where Dad taught all eight grades and served as janitor for $18.00 a month and keep, did not start until after fall harvesting and stopped early in the spring, it was possible for the young teacher to attend summer terms at the Indiana State Normal School at Terre Haute. To earn his expenses, he ran a cooperative boarding house and operated a bookstore. He taught country school for another two winters and in 1907 became superintendent of schools and principal of the high school in Sunman, a town about three miles from his home.

During a part of the time at Terre Haute, Dad lived in the home of Professor James Baxter, a great and dedicated teacher of mathematics. It was he who urged Dad to go on to the University of Michigan, his own alma mater. So after completing the course at Terre Haute, my father spent two years at the University of Michigan, getting his A.B. in 1911, with election to Phi Beta Kappa.

The year after graduation from Michigan, Dad taught at Shortridge High School in Indianapolis. Then he accepted a position in the mathematics department of the University High School of the University of Chicago. Years later, I was shown the historic spot on the stairway where in September, 1912, he met Marie Louise Oury, who taught Latin and history there and who became Mrs. Schorling five years later. It was a family joke that Dad was always partial to brown eyes and married the most beautiful pair he could find, only to be rewarded by having three green-eyed children!

Those must have been good years. I have heard rumors of dinner dances at the Quadrangle Club (where the unmarried instructors lived), and of ice skating on the Midway. But as always, Dad was working hard. In all his life, he never took an hour off from a full time load to do graduate work, even on his doctorate. He received his M.A. at Chicago in 1914. In the high school, he coached the boys' soccer team, sponsored many student activities, and was voted the most popular teacher of the year. Summers he spent as a counselor in a Wisconsin boys' camp and still found time to co-author his first book, *A Review of High School Mathematics*, written with William D. Reeve, and published by the University of Chicago Press in 1915.

During the years at Chicago, Dad made many lifelong friends, among them Dr. Otis W. Caldwell (for whom my younger brother is named). When Dr. Caldwell was called to Teachers College, Columbia University, to organize its new experimental school, he asked my father to be the first principal. Raleigh Schorling and Marie Oury were married on July 26, 1917, and went to New York where Dad assumed his new duties at the Lincoln School.

However, the next spring, he interrupted his work to enlist in the army and was sent to a training school for Field Artillery

officers at Ft. Monroe, Va. 2nd Lt. Raleigh Schorling was demobilized in January of 1919 and returned home to find his family increased by a daughter, named Ruth Mary. Mother says that she was somewhat apprehensive about introducing us for I was a fretful baby. But Dad promptly put me on his shoulder and marched around the room to a tuneless chant of "Eefa safa safa safa eefa safa la." I don't remember that incident, but I know that with my brothers and with my own boys, Dad used this technique, with unfailing success, to secure delighted crows from a baby.

The little family returned to New York and shortly thereafter Dad's second book was published: *General Mathematics*, also written with Reeve. It was at this time that his thirty year association with John R. Clark began. Their first book, *Mathematics for the Seventh School Year*, appeared in 1922. His bibliography lists 41 books and uncountable tests and workbooks which they co-authored.

Although four colleges can claim Raleigh Schorling as an alumnus, he gave his heart to Michigan. Thus it was a dream come true when, in 1923, Dean A. S. Whitney asked him to come to the University of Michigan, with the rank of Associate Professor, to act as principal of the new University High School. Essentially a country man, he had disliked raising a family in New York City (the first boy, Donald Clark, named for John Clark, was born in May of 1922), and it was a joy to come back to peaceful, green Ann Arbor town. In the fall of 1923 the Schorlings moved to Ann Arbor and Otis was born there in November. The following year my father received his Ph.D. from Columbia University. He remained principal of University High School until 1926 and always was Supervisor of Instruction there. In 1927 he became a full professor.

Dad loved teaching youngsters and was loath to give it up. He continued to teach at least one high school class until 1930, and I was lucky enough to be a member of one of his last seventh grade classes. I know now, of course, that he was an inspired teacher. But then we only knew that math, previously despised by many of us, was FUN. We experienced the joy of learning. It was a demonstration class and we were used to visitors and observers but he taught for us. How we loved the "Contracts," when we chose the section of problems to solve, and were graded not only on the difficulty of the contract chosen, but also on the speed and accuracy with which we finished the contracted assignment. Incidentally, I can't remember that any caste distinction existed between those who chose the "A" or "B" contracts, and the less proficient students who did the "C" section. For the slower students were close to Dad's heart and he got pleasure out of making mathematics live for them.

One of the things I remember about that year is the awful day, funny in retrospect, when the back of the room was crowded with teachers in town for the MEA meetings, all waiting to see Dr. Schorling perform his famous demonstration of teaching the relationship between the volume of a cone and that of a cylinder of the same height and radius. It was a vivid demonstration, pioneering the use of visual aids in mathematics teaching, and although for many years now, my only acquaintance with cones has been with the variety containing ice cream, I could do it today. Anyhow, when the class had come to order and the visitors were agog on the edge of their chairs, Dad called the names of the four of us who had promised to bring the rice necessary for the experiment, and there was a ghastly pause. Not one of us scatter-brains had remembered the rice. Dad called me outside the classroom and handed me a quarter with a glare and instructions to "Go get that rice!" He must have stalled successfully until I arrived panting back from Kroger's with the rice, for it was an outstanding demonstration.

During those years the books came popping out like popcorn, and Dad performed the herculean task of revising each one every five years, as well as supervising the high school, teaching a full college load, serving on state and national committees, making speeches, attending conventions, and planning the work of thousands of student teachers who graduated from the University of Michigan during his 27 years there.

Our family life never suffered neglect because of Dad's professional life, for he was a devoted and imaginative parent.

Mr. Schorling with Rudy, His Daughter-in-Law and Ruth Schorling Rickard

He was a wonderful raconteur, and our bedtime stories, drawn from his wealth of experience, were eagerly awaited events. Dad's "way with children" consisted of treating them as individuals, and he was endlessly patient with us, particularly with the incessant questions which he was never too busy to answer. Every night at the dinner table he used to ask each child to relate any special achievement of the day, and how proud we were to tell of an "A" in spelling, and how solemnly he listened and gave praise where praise was due.

Dad was always a sportsman; he taught us tennis and golf, and took us to football and baseball games as soon as we were able to sit up in the stands. He was a rabid Michigan fan who missed very few home games from 1923 to 1949, and the Detroit Tigers ran the Wolverines a close second in his affections. One year he organized the neighborhood into two softball teams, the Mugs and the Wumps (whom he captained) and during the long summer evenings the fathers and youngsters played ball while the mothers formed a cheering section and supplied watermelon. Until he was well past fifty, Dad used to spend an occasional Saturday morning in the U High gym, shooting baskets with my brothers and their friends.

No story about my father would be complete without extensive reference to fish. He was an ardent fisherman, submitting eagerly to the utmost rigors of climate and early rising in pursuit of finny triumphs. His idea of bliss was to arise at 3 A.M. in the company of Marshall Byrn, his close friend since their college days at Terre Haute, and row countless miles, trolling for the elusive, small mouthed bass. Dad caught his biggest fish during his sabbatical leave in 1949, part of which he spent with us here in California. He was a modest man and never kept a press clipping of his professional accomplishments. But there is no modesty among fishermen, and when the sports page of the *Los Angeles Times* reported that the record halibut of the season had been caught at Malibu Beach by Raleigh Schorling of Ann Arbor, Michigan, he bought twenty copies to mail to the envious members of his fishing gang. That was a tremendous fish, 29 pounds of halibut, bigger than my wide-eyed son, who stayed a cautious distance from the monster until it appeared in small pieces on the table. To this day, on the rare occasions when small Robert Raleigh eats in a restaurant, he orders halibut and retells the story of grandpa's prodigious fish.

Dad liked to travel and did a lot of it. We used to tease him about being able to

find someone to pay his way on a trip he intended to take anyhow, and there was a lot of truth in our joking for he was in great demand as a speaker all over the country. I have before me the front page of the Alpena, Michigan, newspaper which Dad once sent me, for he relished a joke on himself. The biggest, blackest headline states that "FISHING SEASON OPENS TODAY," and the smaller headline announces that "Dr. Schorling Speaks to Teachers Association Here." That was no coincidence.

In 1929 my father went to Germany as one of a group of 30 American teachers invited there as guests of the Weimar republic. He found his childhood German very useful and was even able to speak to a group of teachers in Holland. When Dad had a sabbatical leave in 1937, the Schorlings with their three children gave Europe a foretaste of what was to come by invading en masse, complete with car. Dad spent a lot of time visiting German schools and was saddened by the changes wrought by the Nazis in a country which he remembered from his previous visit as a fine, young democracy. But he loved taking us up the Rhine, through the Black Forest, and into Denmark, Austria, and the low countries. The greatest hardship we suffered in Europe was having to wait until Monday or Tuesday to find out from the *Paris Herald* how Michigan's football team had fared on the previous Saturday.

In 1929 Dad had started the "Correlated Course" in Education, a type of course which has been widely adopted in other schools. It consisted of an intensive pre-teaching program at the University for six weeks, then six weeks of observation and practice teaching in the field and a return to the University to correlate these experiences and finish the academic work in Education. When I decided to become a teacher, I took the 1939 Correlated Course, which proved to be the most challenging and stimulating course I ever took, as I found myself for the second time one of my father's students.

A 29-pound Halibut which made the sports column of the *Los Angeles Times*. Biggest fish caught at Malibu Beach that season, March 1949.

My father genuinely loved his students and took a personal interest in them and their lives. He followed their athletic achievements and campus activities, called them by their first names, and knew each as an individual. In return they loved him for his wisdom, his friendly grin and quiet humor, told him their troubles, borrowed money from him, asked his advice about their careers, and expected him to find them jobs, which he did even during the depression years when jobs didn't exist.

Dad was a great believer in picnics and a notable camp cook. For many years the U High faculty had a picnic every spring and many of Dad's classes wound up the year with a June picnic. When we of the correlated course returned from our field

work all over the state of Michigan, we promptly planned a picnic. It followed the pattern of all the others which I remember. Dad purchased the meat and cooked it himself, with the aid of student assistants, who were permitted to gather firewood,

Mr. Schorling with Clyde Vroman, now Director of Admissions, University of Michigan

but not to tamper with his famous mixed grill. Before dinner we square-danced, played softball and even Farmer-in-the-Dell. Then, after eating steak-bacon-hamburg sandwiches, too full to move, we sat on the grass, swatting mosquitoes and singing college songs.

Sometimes people ask how Dad did so many things so well. I think the answer is that he never stopped working. Walking to and from school, he wrote his speeches. He used to sit at home in the evening, playing solitaire in front of the fire, while his mind busied itself with the chapter of a new book. Incidentally, he never kept lecture notes from year to year, but prepared his lesson plans daily for each course, which kept them fresh and topical.

During the summer of 1941 I was assigned the project of helping Dad with the revision of the seventh and eighth grade books, and had an opportunity to see him at work. (This was as a member of the Curriculum Workshop, one of Dad's innovations for graduate students in the School of Education summer session.) He had a hide-out in the basement, which had no telephone and was relatively free of interruptions. We called it the Black Hole of Calcutta, and Dad used to hibernate down there with six copies of the book being revised, a ream of paper, scissors, a pot of rubber cement, and some pencils. There he rewrote, clipping out and pasting into the new text those portions of the old one which merited inclusion in the new edition. Dad used to say that a good sentence was a day's work. Each sentence was cut and polished, reworded half a dozen different ways, and often discarded in the end for a better phrasing. The clarity and simplicity of his prose resulted from the hours he spent in choosing the one word that would exactly express his meaning. During the course of that summer I came to have a profound respect for the years of intensive labor represented by the shelf of books which bear his name.

When World War II came, Dad remembered that he was a farmer and took to victory gardening on a grand scale. He raised vegetables in such profusion that his friends almost cringed when they saw him coming, basket of broccoli in hand. He also did his bit on a larger scale by spending parts of 1943 and 1944 as a civilian in the Bureau of Navy Personnel in Washington, working on a mathematics text for the navy training program.

In the spring of 1945 came the blow from which my father never recovered. Sgt. Clark Schorling was killed in action in Germany and Dad aged overnight. He still had his warm, quiet friendliness, but the lop-sided grin was tired and not so wide as formerly and his step lost its bounce. He kept right on working, harder indeed than before, but with a little less joy and enthusiasm. Mother and Dad established through the Regents of the University of Michigan a "Clark Schorling Memorial Fund" to be administered by the School of Education: "To promote the peacetime equivalents for the challenges that war activities provide for some youth."

During the summer of 1945, despite his deep personal grief, Dad took a group of educators on a tour of army and navy training schools. From this trip came the monograph "Swords Into Ploughshares." In 1946 he authored the famous "Bill of Rights for Teachers," which was acclaimed the first statement of its kind and reprinted by more than 50 newspapers and magazines, including *Time* (August 5, 1946).

Nine more books were to appear in the next four years, the most important being the rewritten *Mathematics in Life*, *Mathematics for the Consumer* (credited with being the first comprehensive book on the subject), and *Student Teaching*, Second Edition, picked as one of the 37 outstanding educational books of 1949, and already adopted for use in over 100 colleges and universities. He continued to commute to Chicago while serving on four national commissions, and to cope with the increased University load caused by postwar enrollment. Honors and recognition in his chosen field came to my father. Harvard University hung in its library a picture of the Indiana boy who became one of the nation's foremost educators, and in April of 1950 he was notified of election to Phi Beta Kappa Associates.

However, that large, wonderful heart of his which he gave to all the world, now showed damage from the years of driving work. At the NEA meetings in Atlantic City he began to feel ill and was very sick from the first of April on, although he refused to let mother tell any of us about his illness.

The 21st of April, 1950, was a typical day in Dad's life. He met his classes, read proof on his last book (*Elementary School Student Teaching*, written with Max Wingo and published by McGraw-Hill in September, 1950) and drove over in the afternoon with mother to see how the painters were coming along on the new house they had been building all winter. It was also his last day for Raleigh Schorling died of heart failure early in the morning of April 22, at the age of 62.

My father will be missed by many people in the world, besides the members of his family. Perhaps the most sincere tribute paid him came in the unconscious pathos of a remark made by one of his students. Late this summer Mother met one of Dad's best students on the campus and asked him if he had found a teaching job yet. He said, "No, I haven't, Mrs. Schorling, but I'm sure Dr. Schorling would have found me one."

". . . Competence in mathematics in many respects parallels literacy in communication. . . . It is nevertheless clear that modern technology has stepped up the minimum requirements of literacy in communication.

"In great-grandfather's day, when life was relatively simple, the ability to compute accurately when dealing with whole numbers, common fractions, decimals, and per cent was adequate for the common affairs of life. There are good reasons for believing that the minimum requirement in mathematics for effective citizenship is moving up and is already *higher than mere control of the four fundamentals of arithmetic.*

"The war has demonstrated in a dramatic way what is nonetheless true in peace time, but not so readily discernible; namely, that a boy lacking certain mathematical competencies is a pathetic victim of a ruthless system. . . .

"Thus, functional competence in the mathematics of common affairs seems as crucial as functional literacy in communication. Unfortunately, it is not generally recognized that the minimum mathematical training needed for citizenship is higher than the level commonly achieved by the product of our schools. . . . A program correlating and emphasizing industrial arts, science, and mathematics is probably a good approach to the *general education* of many pupils who are never going to be satisfied with a purely academic program."—SCHORLING, RALEIGH. "The Need for Cooperative Action in Mathematical Education," *The American Mathematical Monthly*, Vol. 52, April 1945, pp. 196–198.

Raleigh Schorling—Teacher

By JAMES B. EDMONSON
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WHILE the major contributions of Professor Raleigh Schorling in teaching, research, and writing were largely in the field of mathematics, he made an enviable reputation in other educational work. He had in influential part in the organization of the Lincoln School of Teachers College, Columbia University, and served as the first principal of the school. At the University of Michigan he organized the University High School and served as its first principal. He also planned and directed the first program in student teaching offered by the School of Education of the University of Michigan. In addition to his University duties he served on numerous state and national committees and was an exceedingly valuable member of such committees because of his unusual resourcefulness, marked initiative, and fine professional spirit.

Professor Schorling's interest in the general problems of teachers and teaching was unusually deep as evidenced by the fact that he contributed to seven books and six monographs relating to such problems. He was also the author of an extensive list of articles on educational issues. His best known books, outside of the field of mathematics, were in the field of student teaching; and through these books Professor Schorling exerted a nationwide influence on the quality of the experiences provided for prospective teachers. Among the monographs to which he contributed were such titles as: "Swords Into Ploughshares—What Civilian Education Can Learn from the Schools of the Armed Forces," "Social and Economic Trends and Their Educational Implications" (with H. Y. McClusky), and "The Techniques of Textbook Authors" (with J. B. Edmonson). The foregoing titles are indicative of the wide range of Professor Schorling's interests. His articles in educational magazines dealt with such issues as the youth problem, objectives of secondary education, camping problems, and curriculum issues. His most widely known article was doubtless the one entitled "An Evolving Bill of Rights for Teachers," in which 12 rights of the classroom teacher were defined. The article was designed to stimulate discussion of the conditions that might make teaching more attractive to larger numbers of able young people and to make it possible for competent teachers now in service to do more efficient work. This article has been widely quoted in books and magazines, and thousands of reprints have been made available to discussion groups.

Professor Schorling was very highly regarded on the campus of the University of Michigan, and the Board of Regents paid a high tribute to him in a memoir which was adopted on May 20, 1950. Part of this memoir is as follows: " . . . he was alive to the general problems and needs of our school systems and his judgments, expressed in his frequent contributions to educational journals, were heeded by the members of his profession and by laymen alike. . . . Above all, Professor Schorling's broad human sympathy and his instinctive friendliness and helpfulness made themselves felt in all his personal and official relations with his students and fellow faculty members."

Professor Schorling had a host of friends and admirers, and there were innumerable demands on his time for conferences, committee work, and addresses before organizations. He was a splendid colleague and enjoyed unusually high standing in University circles. His achievements brought high distinction to the School of Education at the University of Michigan, and he will long be remembered for his outstanding services as a scholar, a teacher, a writer, and an educational leader.

Raleigh Schorling in World War II

By Joseph J. Wickham
Mathematics Editor, World Book Company
Formerly, Officer-in-charge, Training Courses Section, Bureau of Naval Personnel

During World War II, Raleigh Schorling gave extensively of his time and knowledge to the Training Program of the United States Navy. The idea of a Navy training program was not entirely new. In fact, as far back as World War I, the Navy had instituted a system of Training Course Manuals for use by enlisted men who were striving for promotion in their respective rates. However, the available training courses in all ratings were limited in number and, at the time of Pearl Harbor, considerably outdated. Naval Aviation meanwhile had become a large and extremely important part of the Navy. There were more than 22 regular aviation ratings and 13 specialist designations, but only four training manuals.

Sparked by Admiral A. C. Read of NC-4 fame and approved by Admiral King, Chief of Naval Operations, the Training Courses Section was given the task of preparing a series of training courses for the enlisted men in Naval Aviation. Carefully selected specialists, both military and civilian, were brought into this Section to write original books for the promotion of aviation ratings. Because these ratings were largely technical, it naturally followed that each trainee needed a basic understanding of mathematics. Many books on mathematics were available, but none were aimed at the aviation personnel or, in fact, at any of the Navy's ratings.

What sort of person was needed to prepare a mathematics book for enlisted men in the Navy? Naturally, someone well grounded in mathematics. But he must also be an educator with a sympathetic understanding of American youth and with extensive experience in writing. After considerable sorting and sifting of possible educators to do the work, the final selection was Raleigh Schorling. He came to the Navy shortly after Admiral Nimitz's letter concerning our high school graduates' deficiencies in mathematics had received wide publicity. He felt that the Admiral's criticism of mathematics education was a personal challenge to him to do an important work.

Raleigh Schorling was pleased to be able to give assistance to service men, but he realized at once that he was face to face with a new venture. With this mathematics book there would be no teacher to explain, correct, and reteach; there would be no teacher's manual and no key. "These new books," he was told, "must be books the men will want to read—and in reading them will absorb their substance. To be effective, we have to give them what they like."

Swinging quickly into the spirit of the project and showing that versatility which was characteristic of his thinking, Dr. Schorling soon came up with a workable program. He visited the sailors at the Chicago Pier, Jacksonville, Bainbridge, and other training centers. There he discussed with the men the types of problems that they daily encountered. He sorted and correlated the information he gathered and began rapidly to build a new mathematics textbook. He quickly brought to bear his vast fund of knowledge in the mathematics field and took great joy in creating with a free hand. A few chapter headings from his Navy Training Manual, *Mathematics*, will serve to show the spirit of his work: "Trouble shooting your weaknesses," "Vulgar fractions," "Very vulgar fractions," "New wine in old bottles," "We escape chaos," etc. The following excerpt illustrates the fresh approach he brought to the project.

"If you were sick, you might find it comfort-

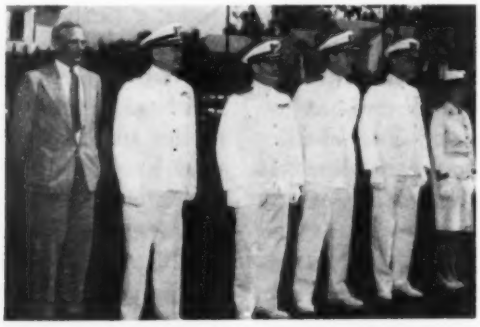
ing to have the doctor tell you that your illness is NOT due to bad teeth, bad food, or bad heart. But you still wouldn't know the cause of your trouble. Even if the doctor tells you that your trouble lies in your respiratory system, you can't be sure whether it is tuberculosis, cat fever, pneumonia, a sinus infection, or what have you. Probably your doctor would start a more detailed diagnosis. That's EXACTLY what this study guide is going to do to spot your addition troubles."

For the enlisted men his style of presentation was most effective, and when salted down with real mathematics, it was unbeatable.

So successful was this initial attempt to give mathematics to the men of Naval Aviation, that Raleigh Schorling was commissioned by the Battleship Navy to do a similar text. The "Doctor," as he was called by officers and sailors alike, worked long hours to help meet the deadline on his text. This was not the five-year plan of the textbook publisher, but the yesterday-was-too-late plan of the speeded-up war program.

An anecdote may help to point up a particular Schorling characteristic. During the strenuous weeks of writing, he often spent Sundays at his Navy desk writing and rewriting, organizing and reorganizing material. Many of his younger associates were glad to take a one-day rest, but Dr. Schorling continued to drive himself. On one rainy Sunday he was carried past his bus stop at the Navy Department and found himself at the rear of the building, which was enclosed by a 12-foot-high cyclone fence. Only the front gate was open, but the entire building was well patrolled by Marine guards. Dr. Schorling, anxious to get to his work and a bit provoked because he was outside the fence and standing in a downpour, decided he would save time by crawling under one of the closed gates. Almost immediately he found himself staring into the business end of a Springfield rifle backed up by a businesslike and suspicious Marine. No, he wasn't shot, but the Navy officer in charge had some careful identifying and extensive explaining to do before Dr. Schorling was released by the Marines and allowed to report for work.

Dr. Schorling's contribution to the war effort was fully appreciated by the Navy. Out of more than one hundred training courses produced by the Training Courses Section during his tenure, his was the only one to carry a personal identification as follows: "Acknowledgment is accorded Dr. Raleigh Schorling, whose teaching methods and procedures are incorporated in this book."



RALEIGH SCHORLING stands the Regimental Review with (l. to r.) Captain John S. Baylis, Commanding Officer, Commander N. S. Fulford, Executive Officer, Commander A. E. French, Training Officer, Commander W. G. Hodgson, Captain of the Yard, and Lt. L. K. Alway, SPAR Training Officer.

As Others Saw Him

By PHILLIP S. JONES
Department of Mathematics, University of Michigan, Ann Arbor, Michigan

DR. HOWARD BATCHELDER of Indiana University writes of his former teacher:

"Dr. Raleigh Schorling's untimely death was felt deeply by thousands of his students who worked closely with him and who came to know him well, his passing marked the loss of a personal friend and a great teacher. Yet, characteristic of all great teachers, the influence he had in shaping the professional thinking and careers of his own students will continue to be felt, in turn, in the lives of their students through the years to come."

This widening circle of influence upon others is the result not only of a teacher's ideas but also of his personality. It is hoped that some appreciation of Raleigh Schorling's personality is at least partially presented here in brief notes from only a few of his many pupils and co-workers.

ALICE M. HACH of Slauson Junior High School in Ann Arbor completed her master's degree under Raleigh Schorling while also teaching for him in the University High School. She writes as follows:

"'God grant me the serenity to accept things I cannot change—Courage to change things that I can—Wisdom to know the difference.' This quotation printed on a large placard stood in a prominent place on a desk in an education office. Opposite the desk a collection of cartoons dealing chiefly with education was displayed on a bulletin board. A small snapshot of a fishing trip, an unusually 'large catch,' was among the display. Against one of the walls were many shelves of books while in the background near the windows were two large foliage plants. The name, Raleigh Schorling, was on the door.

"It was a busy office because here was a man who saw no task impossible, no difficulty insurmountable, and who had the vision and courage to pioneer when convinced of some great need. 'We must come to grips with this,' Dr. Schorling would say. Then with his unusually keen insight he would survey a situation, analyze it, and be ready for action if action seemed advisable.

"Yet Dr. Schorling was never too busy to listen to the personal problems, the requests, and the needs of those who came to him. 'Let me know how you are after the operation. I shall be anxious to hear,' Dr. Schorling said to me when I was in his class for the first time. Nor did Dr. Schorling forget the situation. He inquired a number of times regarding my progress, provided opportunity for me to complete the course by independent study, and arranged for the examination to be taken in my home.

"His enthusiasm for teaching was reflected in a remark made by him in the summer of 1949. 'My one wish is to live long enough to have a helicopter to go up north and fish and come back here to teach my classes.' Throughout his teaching Dr. Schorling never forgot the child. During one of his classes after a detailed study of record keeping and anecdotal records he warned, 'Don't forget when you have records that you also have Mary.' Never was the child forgotten or lost in the maze of theory and method, for anything Dr. Schorling offered was practical and useful.

"One afternoon Dr. Schorling stepped into his methods class and with a twinkle in his eyes set up a hypothetical classroom situation—a skillful teacher was developing a topic in mathematics with a junior high school class. The pupils were challenged and enthusiastic. Just at the critical point in the development the bell rang for passing. Should the teacher quickly give the answer or should the teacher postpone the work and ask the children to save their papers for the next day? After agree-

ment by the class that the work should be postponed, a second question was raised. 'What might you as a teacher anticipate for the beginning of the next period?' At this point many suggestions were given such as the following. 'Many pupils would discover the answer before class.' 'Pupils would get help from their parents.' 'The children would ask pupils in other classes.' Each time Dr. Schorling would shake his head and say, 'Well, maybe, but probably not.' Finally after, the class was at a loss for ideas, Dr. Schorling chuckled and said, 'You would probably find that they had lost their papers!'

"Dr. Schorling was fascinated by an amaryllis that was blooming in my classroom. He admired the flower a number of times and studied the growth curve made by a seventh grade class. It was evident that Dr. Schorling liked flowers. 'You should see our garden,' was a comment Dr. Schorling often made. In the fall, choice chrysanthemums were lying on the counter in the high school office brought by Dr. Schorling to be shared with his teachers.

"This is Dr. Schorling as I knew him—my teacher, my counselor, my supervisor, and more than anything else my friend. The office door no longer bears the name, Raleigh Schorling, but in the lives of those who knew him, and through his writings for those who did not know him personally the door is not closed, for Raleigh Schorling has taken his place among the immortals."

Hope H. Chipman and Katharine Hill, mathematics critic teachers in the University High School of the University of Michigan knew him both as the chairman of their department and as a co-worker in teacher training who often called upon them to share the burden of instruction in special methods. The fact that their notes were written without collaboration makes the similarity of their comments add emphasis and conviction to that which they say. HOPE CHIPMAN writes:

"Dr. Schorling's sympathetic interest in his associates quickly made the members of his department think of him as a close friend. I know that I started out feeling very much in awe of him but I was soon asking his opinion on my insurance program, on some small investments I wanted to make, and on such matters as where to buy the best seeds and plants in the spring and where to find a man to put on our screens. We knew about his family and he knew about ours. If there were illness or a death in one of our families we knew his prompt expression of sympathy was honestly felt. We heard about his garden and his fishing success and his latest trip. It was fun to have him come in to sit on a table with his feet swinging while he told about an exciting meeting he had been attending in New York or Chicago or Los Angeles.

"There probably has never been a busier man, but when I went to his office I could be sure of a welcome, and that he would give my question his attention and helpful answer.

"One of my first contacts with him illustrates a happy facet of his character. At the end of the very first afternoon of classes in my experience at University High School, a warm sunny September day, Miss Hill and I started to leave the building together. As we walked down the hall toward Dr. Schorling's office he motioned to us to come in. There was some pleasant discussion about how the day had gone and then he said, 'Get out into the sunshine now. And remember, in this school when you do not have a class your time is your own. You do not need to feel that you must be here every minute of the day.' That gave me a wonderful feeling and it illustrates one of the traits that made Dr. Schorling such a fine man with whom to work. He trusted us all to do our best and left us free to do our work in our own way."

KATHARINE HILL uses the following words to tell how he appeared to her.

(Continued on page 99)

The General Mathematics Movement and Raleigh Schorling's Significant Contribution to It

By WILLIAM D. REEVE *and* JOHN R. CLARK
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THE reform movement in the teaching of secondary mathematics, variously known as fused mathematics, correlated mathematics, integrated mathematics, fundamental mathematics and general mathematics, was initiated and promoted by a group of teachers in the Chicago area during the first two decades of the century. Among the group in order of their identification with it, were George Myers of the School of Education of the University of Chicago, Ernst Breslich, R. M. Matthews, William D. Reeve, and Raleigh Schorling, of the University of Chicago High School, Harold Rugg of the School of Education of the University of Chicago, and John R. Clark of the Chicago Teachers College.

In his teacher training courses in the School of Education at the University, G. W. Myers attacked the traditional organization of arithmetic, algebra, geometry, and trigonometry as being out of line with the demands of effective learning. He argued that the traditional organization creates artificial barriers, blocks, and learning difficulties. Moreover, he said that such an organization may have appeal for the scholar and the mathematician, but that it is not a sound organization for the immature, beginning pupil.

On December 9, 1902, Eliakim Hastings Moore, head of the mathematics department of the University of Chicago, made his famous presidential address before The American Mathematical Society[1] in which he argued that the water tight compartmental organization of mathematics should be abandoned and advocated a closer correlation between mathematical subjects. Moore's speech did a great deal to stimulate further thinking and activity not only in the Chicago area, but elsewhere as well.

Early in the century Myers enlisted the cooperation of the members of the department of mathematics[2] in the University of Chicago High School in thinking through the problem of reorganization of the content material for teaching purposes. In 1903–4 a tentative program in correlated mathematics was worked out, revised and then used in mimeographed form as a text in the first year classes of the University of Chicago High School in 1904–5. The material was revised, remimeographed, and tried out again in the first year classes. After it was revised once more the course was published as a text.[3] In September 1909 a revised and larger edition of the above text was published with two other teachers[4] cooperating. Early in 1910 the University of Chicago Press published a second text called "Second Year Mathematics for Secondary Schools" which was used in the second year classes of the University of Chicago High School.

The above texts were then used for four or five years in the first two years of the University of Chicago High School, where Breslich was now the head of the

[1] Moore, Eliakim Hastings. On the Foundations of Mathematics. *Science*, N. S. Vol. XVII, pp. 401–416, March 13, 1903. Also The First Yearbook of The National Council of Teachers of Mathematics, pp. 32–57, 1926.

[2] They were William R. Wickes, Ernst R. Breslich, Harris F. McNeish and Ernest R. Wreidt.

[3] *First Year Mathematics.* University of Chicago Press. 1906.

[4] They were Arnold Dresden and Ernest L. Caldwell.

mathematics department. Through the influence of Charles H. Judd, Eliakim H. Moore and Franklin W. Johnson and with the approval of Myers, Breslich began a revision of the texts mentioned above and entirely rewrote both volumes which later[5] appeared under his name as sole author.

Reeve went to the University of Chicago High School in 1910, Schorling in 1912 and Horace C. Wright shortly after. These men all read and criticized Breslich's work before it went to the printer. Through the efforts of the above group of teachers the movement for a more modern type of mathematics waxed strong and grew in prestige.[6]

Many mathematics teachers went to the University of Chicago High School to observe the classroom instruction of Breslich, Reeve, Schorling, and Wright and to exchange ideas with them concerning the new organization of the subject matter.

Reeve left Chicago in 1915 to go to Minneapolis as head of the department of mathematics in the University of Minnesota High School. Since he and Schorling were interested in developing a general mathematics course they proceeded to prepare an experimental edition which was tried out by Reeve with a number of cooperating schools in the twin cities, Minneapolis and St. Paul. After considerable discussion with these schools and after careful revision this material was published in 1919.[7] Schorling, went to the Lincoln School of Teachers College in 1916 as head of the mathematics department and shortly induced Clark to join him there. Both of these men began a vigorous promotion of the concept of general mathematics and later collaborated on some junior high school texts along general mathematics lines.

In 1917 Harold Rugg and Clark published a monograph called "Scientific Method in the Reorganization of Ninth Grade Mathematics," which stimulated further interest and discussion of the merits of general mathematics. This was followed in 1918 by their text book for the ninth grade called "Fundamentals of High School Mathematics."[8] In 1922 Reeve published a second book[9] which grew out of his experimental work at Minnesota.

From this time until his death Schorling was an ardent supporter of general mathematics. Moreover he showed great insight into the problems of improving the teaching of mathematics and continued all through his lifetime to be a keen and constant contributor to the literature in the field. We know how happy he always was to see the old formalism and compartmentalization of subjects replaced by more unified, correlated, integrated or general mathematics. In his passing our field has lost a great teacher and an outstanding leader.

[5] Breslich, E. R. *First Year Mathematics*, 1915, and *Second Year Mathematics*, 1916. University of Chicago Press.

[6] In 1917 Breslich published a third book called *Third Year Mathematics*, which was also published by the University of Chicago Press.

[7] Schorling, Raleigh and Reeve, William D. *General Mathematics*, 1919. Ginn & Co.

[8] Rugg, Harold, and Clark, John R., *Fundamentals of High School Mathematics*. World Book Company, 1918.

[9] Reeve, Wm. D. *General Mathematics*, Book II. Ginn & Co. 1922.

Testing

By MARY A. POTTER

Supervisor of Mathematics, Racine Public Schools, Racine, Wisconsin

EARLY in Raleigh Schorling's career he was fascinated by the possibilities of testing as a scientific technique to use in increasing competence in mathematics in American education. Although he had an unusual flair for dramatizing the principles of mathematics, he considered teaching a science as well as an art and used tests as scientific tools to improve the outcomes of instruction.

Educational testing was in its infancy when Mr. Schorling began to teach. But few tests in mathematics had been standardized and—like pioneer work in many fields—these tests were important not because of their quality but because they showed the power of a new method of evaluation of pupils' attainment in mathematics.

To Mr. Schorling, devising a test was not an end to be achieved, it was merely a step toward the end of better teaching. From his President's address entitled "Improving the Quality of Scholarship" printed in the *First Year Book* of the National Council of Teachers of Mathematics to his recent pleas for "functional competence in mathematics," he strove for a higher level of skills, understanding, and thinking from the children educated in our schools, and helped focus attention of educators upon the general lack of accomplishment in arithmetic, backing his statements by per cents of failures made by large numbers of pupils upon certain exercises found in standardized tests.

Following Mr. Schorling's concern with the teaching of mathematics in the six upper grades, he—usually in collaboration with others—wrote tests in the various subjects commonly taught at those levels—arithmetic, algebra, and geometry. He did not confine himself to tests of achievement but developed a new type called instructional tests, a form widely used later in many other school subjects. In line with modern trends, he became interested in and collaborated in constructing a test in functional thinking. He encouraged the construction of new type examinations by students in his classes and his last work in testing was to sponsor a "Test in Functional Competence" by David J. Davis, soon to be published, which has already appeared in experimental form as part of an Evaluation and Adjustment Series.

During his career as a writer of tests his procedure usually followed a uniform pattern. First, he had to be convinced that a test for some specific purpose should be written; he listed very clearly the objectives that he wished to accomplish; he wrote an experimental edition which was published and which he submitted to a number of competent critics; the test was then revised and standardized. Norms were established by data obtained by a wide geographical distribution. Performance of pupils in many types of school systems were used in standardizing the tests; there was a sampling of scores made by children in cities of various sizes and of scores made by pupils in rural areas, collecting the latter being a time consuming task. As might be expected from Mr. Schorling's interest in scientific methods, before 1928 when business computing machines were still a curiosity, the reliability of two forms of the Schorling-Clark-Potter Arithmetic Test was computed on one of these rare machines which had been loaned to the University of Michigan.

The unreliability, difficulty of grading, narrow sampling, and general failure of the essay type test in geometry was a challenge to mathematics teachers, which had been met by only one pioneer new-type examination, the Minnick-Geometry

Test. Young Mr. Schorling, then of the Lincoln School, accepted this challenge and began work on a new-type power test in geometry in about 1920. Details of its construction and standardization are presented by his collaborator, Miss Vera Sanford, in THE MATHEMATICS TEACHER of January, 1925 p. 22–36, from which we quote:

"The original idea of the test was this: to make an examination which would be comprehensive in the ground covered, which would require a minimum of writing, which would be objective and therefore quick to score, and which could be taken in a short time.

"In its original form the test was in seven divisions which may best be described by the type of question each contained. These were: completion sentences; true-false of conclusions from given data; true-false of converse statements; matching reasons against conclusions; drawing valid conclusions from given data; computation; analyzing constructions.

"In order to get a measure of both the very good and the very poor pupils, it was planned that each part of the test should contain questions of graded difficulty and to keep the test within a short time limit, it was proposed that the questions of each unit be arranged in order of difficulty. Ideally, then, a pupil's progress through each unit should be an indication of his ability and if he failed on the fourth question of a group, he might reasonably be expected to fail on the later ones."

Additional discussion and specimen questions from that test are given in the National Committee report of 1923, *The Reorganization of Mathematics in Secondary Education*, pp. 380, 390–395 in the chapter by Clifford Upton on Standardized Tests in Mathematics for Secondary Schools. Further revisions of the examination were made by Miss Sanford and Mr. Schorling which included a new feature, the thought-provoking true-false-cannot tell. This test in two forms was subsequently published by the Bureau of Publication at Teachers College, Columbia University under the title The Schorling-Sanford Achievement Test in Geometry.

Soon after the completion of the geometry examination Mr. Schorling, in cooperation with John R. Clark and Selma Lindell, began work on the first of the instructional tests which was published in 1925 by the World Book Company under the title "Instructional Tests in Algebra, Adjusted for Pupils of Varying Abilities." These tests introduced the unique feature of including both tests and practice material. If a student did well enough on the first trial on some of these tests, he was permitted to skip certain tests. If he did not reach a desirable goal on practice material, he took the same test again to improve his skill by the necessary practice. This remedial work was organized to conform with Mr. Schorling's list of principles in the psychology of drill which he discussed in his President's Address, previously referred to, which is printed in the *First Year Book* of the National Council of Teachers of Mathematics on pages 58 to 105. This philosophy deeply influenced his writings and since the number of copies of the *First Year Book* is limited, these principles of drill are quoted below.

"1. Drill to be effective must be individual.

2. In general there should be much practice for a few skills rather than a little drill on each of many things.

3. A drill exercise should be specific.

4. A drill exercise must provide a scoring technique so that the pupil may watch his daily growth.

5. A drill exercise should be standardized.

6. Drill material should be constructed so as to make possible the diagnosis of individual abilities.

7. In the early stages in the fixing of a bond, progress should be relatively deliberate.

8. Drill should be organized so as to prevent the use of 'crutches.'

9. Not all bonds should be given practice until high skill is obtained.

10. The goal of a drill exercise should be a reasonable one.

11. *Right* practice makes perfect.

12. Errors should be corrected before habits become fixed.

13. Everything else being equal, a skill that is fixed in its natural setting will need less repetition.

14. In establishing a skill try to avoid the stage of diminishing returns.

15. School life should be staged so that all desirable activities will have pleasurable outcomes and all undesirable activities will eventuate in unpleasant results.

16. In fixing a habit a pupil must be given an attitude in which he becomes a student of his own growth.

17. Habits must be formed in the psychological order.

18. Practice should be distributed in diminishing amounts and at increasing intervals.

19. The more interesting aspects that enter into a skill should be taught early.

20. The less difficult elements should be given before the more difficult."

A revision of the "Instructional Tests in Algebra" was one of Mr. Schorling's last publications and bears a 1949 copyright date.

"Messrs. John R. Clark, Raleigh Schorling, and Harold Rugg, of the Lincoln School of Teachers College, Columbia University" to again quote the 1923 Report, p. 306–7, "found themselves handicapped in carrying on certain experimental work to improve the teaching of mathematics in the junior high school unless they could determine with a fair degree of certainty the knowledge which the children were supposed to have as a result of their study in the first six grades. Accordingly they devised an Inventory Test in Arithmetic to be given to children at the beginning of the seventh grade as a measure of their knowledge of arithmetic obtained in the first six grades. The Inventory Test consists of two four-page pamphlets containing in all one hundred twenty-five questions."

Since there was need for a power test to measure progress in the upper grades, in 1927 this examination was revised by gearing it to the more difficult phases of arithmetic taught in grades 7 and 8 and omitting, of necessity, most of the simple skills usually acquired in the lower grades whose acquisition can be measured by other tests. The revised examination was published under the title "Schorling-Clark-Potter Arithmetic Test." A second revision with another standardization appeared in 1942 and was called "Hundred-Problem Arithmetic Test."

Instructional Tests in Arithmetic booklets for each of grades 5, 6, 7 and 8 written by Mr. Schorling in collaboration with John R. Clark and Mary A. Potter was a natural sequel to "Instructional Tests in Algebra." This series, based upon the same pattern and conforming to the same psychological principles of drill, was first published for general sale in 1928, experimental work on the tests went back to 1923. Experiments with several thousand children, whose performances on individual tests were plotted, furnished the passing and failing goals for diagnostic tests as well as the x, y, and z goals for the practice material.

Learning to Compute, Books One and Two by the same authors and Carroll F. Deady was a revision of the 7th and 8th grade books on Instructional Tests, changed to agree with the more recent knowledge of the science of education. *Learning to Compute, Book Two* was adapted by the United States Armed Forces Institute and published as *Review Arithmetic* in two pamphlets with enough blank pages to be used in preparing the lessons.

A more recent power test in mathematics, written by Judson W. Foust and sponsored by Mr. Schorling, is called the "Foust-Schorling Test of Functional Thinking." This new-type mathematics test of 80 items was devised for use in high

school or college and is designed to measure ability to think in the terms of the symbols and concepts of mathematics, independent of ability to compute.

Although testing in mathematics was not the main educational interest of Raleigh Schorling, his influence in that field was enormous due to his keenness in analyzing the problems of testing, the resourcefulness he used in meeting those problems, his originality in techniques of test construction, his common sense use of test results, and his enormous energy in doing tasks that he felt should be done.

Tests published include:

An Inventory Test in Arithmetic (with Clark and Rugg). New York City: The Lincoln School of Teachers College, 1920.

Survey Tests in Arithmetic (with Clark). Forms A and B. Ann Arbor, Michigan: George Wahr, 1923.

Practice Exercises for Accuracy and Speed in the Fundamentals of Arithmetic (preliminary edition) (with Clark). Yonkers, New York: Gazette Press, 1923. Pp. 31.

Achievement Test in Plane Geometry—Forms A and B (with Sanford). New York: Teachers College Bureau of Publications, 1926. Pp. 11.

Schorling-Clark-Potter Arithmetic Test (with Clark and Potter). Forms A and B. Yonkers, New York: World Book Company, 1928.

Instructional Tests in Algebra with Goals for Pupils of Varying Ability (with Clark and Lindell). Yonkers, New York: World Book Company, 1926. Pp. vii+72.

Instructional Tests in Arithmetic, Fifth Grade (with Clark and Potter). Yonkers, New York: World Book Company, 1928. Pp. vi+57.

Instructional Tests in Arithmetic, Sixth Grade (with Clark and Potter). Yonkers, New York: World Book Company, 1928. Pp. vi+66.

Instructional Tests in Arithmetic, Seventh Grade (with Clark and Potter). Yonkers, New York: World Book Company, 1928. Pp. vi+65.

Instructional Tests in Arithmetic, Eighth Grade (with Clark and Potter). Yonkers, New York: World Book Company, 1928. Pp. vi+78.

Instructional Tests in Arithmetic, Teacher's Manual (with Clark and Potter). Yonkers, New York: World Book Company, 1928. Pp. iii+24.

Practice Exercises for Accuracy in the Fundamentals of Arithmetic Adjusted to Students at Three Levels of Ability (with Clark and Potter). Ann Arbor, Michigan: George Wahr, 1928. Pp. iii+80.

Standardized Check List for the Organization of Senior High School Grades (with O. I. Frederick). Ann Arbor, Michigan: Ann Arbor Press, 1933. Pp. 16.

Standardized Check List for the Organization of Junior High School Grades (with O. I. Frederick). Ann Arbor, Michigan: The Ann Arbor Press, 1933. Pp. 16.

Hundred Problem Arithmetic Test, Form V (with Clark and Potter). Yonkers, New York: World Book Company, 1938.

Learning to Compute, Book One (with Clark, Potter, and Deady). Yonkers, New York: World Book Company, 1940. Pp. viii+104.

Learning to Compute, Book Two (with Clark, Potter, and Deady). Yonkers, New York: World Book Company, 1940. Pp. viii+104.

Hundred Problem Test, Form W (with Clark and Potter). Yonkers, New York: World Book Company, 1942.

Test of Functional Thinking in Mathematics (with Foust). Yonkers, New York: World Book Company, 1942.

Workbook in Arithmetic, Grade Seven (with Clark, Smith, and Lankford). Yonkers, New York: World Book Company, 1947. Pp. 160.

Workbook in General Mathematics, Basic Course (with Clark and Lankford). Yonkers, New York: World Book Company, 1947. Pp. 160.

Workbook in Arithmetic, Grade Eight (with Clark, Smith, and Lankford). Yonkers, New York: World Book Company, 1948. Pp. 160.

Chapter Tests—Algebra—First Course (with Smith and Clark). Yonkers, New York: World Book Company, 1949. Pp. 29.

Instructional Tests in Algebra, Revised Edition. Yonkers, New York: World Book Company, 1949. Pp. viii+88.

"... Provision for growth in the mastery of arithmetic should be continuous throughout the elementary and secondary schools. ... In the past two decades, professional courses for teachers dealing with the teaching of arithmetic practically disappeared from our teachers colleges, with the result that most beginning teachers do not know how to teach arithmetic. In fact, some actually fear it and escape the task by excessive attention to other activities in which they feel more confident. To make matters worse, many are tempted to teach the little they do teach by the incidental method—presumably the ideal method, but also the most difficult which only a few out of a hundred teachers could manage even if they had good training. The teaching of arithmetic can be and must be improved. Here is a problem that is not trivial, and one on which we need help."—SCHORLING, RALEIGH. "The Need for Cooperative Action in Mathematical Education," *The American Mathematical Monthly*, Vol. 52, April, 1945, p. 196.

The Reports of the Post-War Planning Commission

By ROLLAND R. SMITH
Public Schools, Springfield, Massachusetts

A MAN who was intimately associated with Raleigh Schorling for the last thirty years wrote me just last week, "Schorling's cooperation on committee work was solicited because of his professional competence and willingness to work, to work hard." The purpose of this article is to record briefly Schorling's part on two important committees, the committee that went to Washington during the war to prepare the report called Pre-Induction Courses in Mathematics and the Postwar Commission that published three outstanding reports.

After several months of seemingly futile correspondence with the United States Office of Education and the Civilian Pre-Induction Training Branch of the War Department, I got a telephone call from the U. S. Office of Education. This was on Thursday, Dec. 10, 1942. The call was urgent. "Can you be in Washington on Monday morning with a committee ready to work?" was the question. There was no time to think. I had to have men seasoned in that kind of thing. I called Mallory, Reeve, and Schorling and to my relief they all accepted. They met me in Washington on Monday morning.

Our job was to discover, by means of conferences with men in the training departments of the armed forces and by reading pamphlets and books used by them as instruction material, what mathematics was needed by our youth before they were inducted into the service. We worked hard but we worked more efficiently because Schorling had been working in Washington before and knew the places to go and the men to see.

We went to Washington prepared to stay a month, but we gathered our data and then went home in a week, especially because Schorling had to attend his daughter's wedding. He was devoted to his family. No report could take precedence over it.

A week later we all gathered in New York and worked in Dr. Reeve's office. We worked for days before the report was ready. Schorling was unable to attend because he had developed pneumonia and was confined to his house. In lieu of his presence, he sent in a completed report for us to consider. Always a quick thinker and a facile writer, he had finished a report on his way home to the wedding. The committee did not accept his writing in its entirety but it did incorporate much of what he had written.

The report was published in THE MATHEMATICS TEACHER of March 1943 under the title Pre-Induction Courses in Mathematics. It was also printed separately by the United States Office of Education and distributed by the thousands. It did much to bring order out of the chaos prevailing in the objectives of secondary school teaching of mathematics as preparation for the war effort. This one quotation will suffice to show how sanity prevailed in the writing of the report in spite of the advice from here, there and everywhere that every boy and girl should study mathematics of the academic type. "The four-year sequence in mathematics, including trigonometry and solid geometry should be taken by those students who have a real interest in mathematics, who are capable of mastery of the subject, or are likely to use mathematics in their further training and ultimate occupation. Counselors must realize the need for certain mathematical skills and understandings. On the other hand it is wasteful to put pupils into courses if their aptitudes

and abilities indicate that they cannot obtain a secure mastery of the material they are studying. It should be remembered in every case that unless the mathematics taught is thoroughly mastered, it will neither be of practical use nor will it serve the other purposes of mathematical study."

One of the men on that committee wrote me, "Dr. Schorling's enthusiasm and unbounded energy contributed in no small degree to his committee work. His zeal for high school courses in Consumer Mathematics is evident in all of the reports. His fund of stories lightened the arduous committee sessions."

When I retired as president of The National Council of Teachers of Mathematics in February 1944 the time had come to think about mathematics in the postwar era. We hoped we would not lose the ground we had gained during the war. I discussed the possibility of a Postwar Commission with the board of directors and the active past presidents and was directed to appoint such a commission. Schorling was the man I wanted for chairman because he had the "know how," the contacts, and the reputation for hard work. He accepted the chairmanship and then followed what I believe to be his greatest contribution to the work of The National Council.

We had a small committee at first, only four members besides the chairman. The First Report came out in May 1944 only a short time after the commission was appointed. It was a preliminary report asking for suggestions. It was general in nature but it had in it the germs of the more influential Second Report. Even a casual reading will show Schorling's great interest in a new kind of mathematics for what he believed to be the majority of students. One of its statements was, "We should differentiate on the basis of needs, without stigmatizing any group, and we should provide new and better courses for a high fraction of the school's population whose mathematical needs are not so well met in the traditional sequential courses."

Then the commission was gradually increased to give better representation of various parts of the country. At the time of the Second Report there were eleven members. When the Guidance Pamphlet was published there were thirteen members. The commission held meetings whenever The National Council met and several times in between. Work was assigned. Manuscripts went back and forth. Finally the Second Report came out in May 1945.

This report was very emphatic in its recommendation for mathematics for functional competence. The check list of twenty-eight items, Schorling's idea, has given the greatest impetus to general mathematics. Almost every new book that comes out in this field makes reference to this check list. The work on the reorganization of mathematics begun in 1916 and reported in 1923 finds its latest development in this report.

The Guidance Pamphlet, the last work of the Postwar Commission, was also Schorling's idea. There were grand plans for it. The Commission wanted to have it illustrated in color and have it filled with cartoons to insure its acceptability by the young folks. We even got as far as to write part of it in that vernacular used by the present day high school pupil. This was distributed for criticism but a number of readers feared that this form would make some educators discredit the scientific value of the pamphlet. The proposed plan for illustrating the text was dropped on account of lack of funds. Even without these added attractions it has proved to be vitally helpful. Over forty thousand copies have been distributed and have been used by counselors and teachers to show the need of mathematics on various levels. A striking attribute of the pamphlet was that it took into account the fact that all students did not need the academic mathematics courses so long as they were not the only courses given.

When I was asked to write this article

about Schorling's work on The National Council's committees, I immediately wrote to get the views of the other members. Many of the replies are expressed so much better than I could do that I am quoting them verbatim.

"Raleigh was an excellent chairman for the Commission. This position gave full play to the fine qualities I had known in him over a period of years. He was an excellent presiding officer, never hesitating to state his own views on important issues but at the same time never insisting that those views be accepted. Every one had a chance to say what he wanted to say, so that the Commission, composed of very unlike personalities and representing quite hostile conceptions, nevertheless worked together with a minimum of friction."

"He had an amazing capacity for simultaneously carrying on a multitude of activities. Many times he brought us up to date on current research projects in related areas. He was able to maintain our interest in the work at a sufficient level that the ball kept rolling, in spite of the fact that each of us was overloaded with other duties. He must have done an enormous amount of work himself. He was unquestionably the driving force in the Commission and had a good grasp of the problem at hand as well as ideas concerning the logical solution. I did not feel, however, that he imposed his will upon us but rather that he sought our opinions and was careful to honor them. The finished product was a composite of our efforts rather than a tempered statement of his own ideas. I doubt if I shall ever forget his sense of humor and his ability to tell a story. The twinkle which lit his eyes and the accompanying smile were well-nigh irresistible."

"He was energetic and persistent in carrying through this program in the face of inadequate funds and related difficulties. The Guidance Pamphlet which was evolved under his leadership will continue to influence the teaching of secondary mathematics for years to come. In particular, the formulation of the Check List in that pamphlet was primarily his contribution."

"Be sure to include in your article his gentle courtesy, humility regarding his own ideas, willingness to listen and when convinced to change his mind. He was firm when he needed to be, an excellent moderator when moments could be tense."

"When I look back upon the many meetings that I attended these thoughts and impressions come to my mind: Schorling's unusual resourcefulness and breadth of vision when undertaking a project or problem. His professional courage and vision. His fairmindedness and tolerance. His keen sense of humor. His energy and drive, never sparing himself. His capacity to get the right people to contribute to a joint undertaking."

All the members of the Commission have stated that it was a pleasure to work with him.

The last years of his life were saddened by the loss of his son. Just when he and Mrs. Schorling were rejoicing at the end of the war, they learned, the day afterward, that their son had been killed in action.

The Reorganization Report of 1923

By CHARLES H. BUTLER
Western Michigan College, Kalamazoo, Michigan

AN APPRECIATIVE understanding of the position and the program of mathematics in the modern American scheme of secondary education can best be had by viewing it against the backdrop of history. Its evolution from the stereotyped arithmetic of colonial days to the comprehensive and varied offering of today represents a continuing effort to make mathematics contribute all it could toward the achievement of the broad aims of prevailing educational philosophies, and many influences have been operative in shaping its course. The story of the evolving program of secondary mathematics has been fully and well recounted in numerous books and articles. It is not the purpose of this paper to tell the whole story again, but merely to indicate something of the contribution of one important committee, and especially of one of its members, to the development of the program in mathematics in the United States in the past quarter of a century. This committee was the National Committee on Mathematical Requirements, and the member of it to whom reference was made was the late Professor Raleigh Schorling, to whose memory this issue of THE MATHEMATICS TEACHER is dedicated.

The so-called "reorganization movement" in mathematical education may be thought of as beginning at about the turn of the century, though it may have had its real genesis a little earlier than that. In the ensuing quarter of a century there was a rather widespread awakening of interest in the matter of reorganizing the mathematical courses and of improving the work in mathematics in the secondary schools. Notable impetus was given to this movement by such events as the presidential address of Professor E. H. Moore to the American Mathematical Society in 1902, by the appearance of reports of numerous committees and commissions, including, among others, those of the Committee on College Entrance Requirements and the College Entrance Examination Board, the International Commission on the Teaching of Mathematics, and the National Committee on Mathematical Requirements, by the unprecedented growth of the high school, and by the emergence and rapid expansion of the junior high school as an accepted part of the secondary school. An admirable account of the significant changes and improvements in secondary school mathematics in the first quarter of the twentieth century was prepared twenty-five years ago by David Eugene Smith. Under the title "A General Survey of the Progress of Mathematics in Our High Schools in the Last Twenty-Five Years" this illuminating article was published in 1926. Appropriately, it forms the opening chapter in the First Yearbook of the National Council of Teachers of Mathematics.

It was near the end of that quarter-century of progress that the classic report on The Reorganization of Mathematics in Secondary Education made its appearance. First published in 1923, this report was destined to have what was probably a more powerful effect in shaping the course of mathematical education than any other report published either before or since that time.

The committee which prepared this report was known as the National Committee on Mathematical Requirements. The nucleus of this committee consisted of six distinguished mathematicians, all filling eminent positions in leading universities, who were appointed in 1916 by the then president of the Mathematical Association of America. With its membership subsequently expanded to fourteen, to include representatives of high school

mathematics as well as representatives of collegiate and university mathematics, the committee worked for seven years before presenting its final report to the public. Thus it is clear that the report represented the combined and mature judgment of a representative group of extremely competent people.

The task assigned to this committee can be summarized broadly by quoting briefly from the Preface to the report:

"The National Committee on Mathematical Requirements was organized . . . for the purpose of giving national expression to the movement for reform in the teaching of mathematics, which had gained considerable headway in various parts of the country, but which lacked the power that coördination and united effort alone could give. . . . This [original] committee was instructed to add to its membership so as to secure adequate representation of secondary school interests, and then to undertake a comprehensive study of the whole problem concerned with the improvement of mathematical education and to cover the field of secondary and collegiate mathematics."[1]

The report was published by the Mathematical Association of America, under whose auspices the committee was established. The original edition contained more than 650 printed pages. Several thousand copies of this monumental report were printed, and through the financial assistance of the General Education Board these were distributed gratis to interested individuals, schools, and libraries.[2]

The report was in two parts. Part I consisted of eight chapters in which were set forth the general principles that the committee felt should be observed in efforts to improve the courses and the work in mathematics, and the committee's recommendations for bringing about improvements in the courses at the different grade levels. This part of the report includes able and lucid statements of the committee's ideas and recommendations respecting the aims of mathematical instruction, the content and arrangement of the subject matter for the junior high school grades and the senior high school grades, specific proposals for the topical content and the arrangement of the courses in algebra and demonstrative geometry, suggestions looking toward more uniformity in the usage of terms and symbols and toward increased emphasis on the function concept, and proposals for the redefinition of college entrance requirements.

Part II consisted also of eight chapters in which were reported descriptions and results of a number of special investigations which were conducted for the committee. Of special significance among these were extensive investigations of the status of disciplinary values, of experimental courses in mathematics, of standardized tests in mathematics, and of the training of teachers of mathematics.

Even in its early stages the work of the Committee on Mathematical Requirements began to exert a marked influence upon the materials of the courses and upon the viewpoint governing instruction. As far back as 1926 one of the most competent and critical observers of mathematical education wrote, "It is not too much to say that the advance in the teaching of mathematics in the last decade has been due in large part to the work of this committee." By changing the word "decade" to "thirty-five years" the same statement could have been made without other modification and with equal assurance in 1951.

It is fortunate that the Reorganization Report came when it did. It came at a time when educational experimentation and curriculum and course revision were

[1] National Committee on Mathematical Requirements: "The Reorganization of Mathematics in Secondary Education," (Hanover, N. H.: The Dartmouth Press, 1923), p. vii.

[2] The original edition has long been out of print. Part I of the report was subsequently republished by Houghton Mifflin Company.

in the air anyway; when the whole educational atmosphere was becoming charged with unrest and uncertainty both as to ends and means to those ends; when in view of this it was inevitable that the mathematical program would be subjected to many conflicting claims and counterclaims, and that its objectives, subject matter, and methods would be sharply challenged. At such a time it was well indeed that mathematics had taken such an adequate step toward setting its own house in order.

For a quarter of a century now, that report has stood as a powerful beacon and a bulwark for the mathematics program of the secondary school. It has defined the aims with vision and clarity. Its recommendations have provided guiding principles for a sensibly forward-looking program of course revision and instruction, and at the same time they have provided a stabilizing influence which has been of great value.

The effects of the report have been clearly discernible in every course and at every grade level in the secondary school. Its recommendations for the work of the seventh and eighth grades long ago set the main pattern for the work in these grades. In ninth grade algebra it made recommendations regarding such things as emphasis upon the function concept, the meaning, notation, and use of the formula, the technique and interpretation of graphical representation of functions, the types of exercises appropriate to this level of instruction in such topics as directed numbers, equations, factoring, operations with fractions, and very simple numerical trigonometry. These recommendations have been widely reflected in textbooks and courses of study almost ever since the report first appeared. In like manner, many of the modifications and shifts of emphasis which have been made in courses in plane and solid geometry, trigonometry, and algebra beyond the ninth grade were foreshadowed by the recommendations made in the Reorganization Report.

Of course the mere fact that one phenomenon is followed by a second phenomenon does not prove that the second is caused by the first. *Post hoc, ergo propter hoc* is an all-too-common pitfall for the unwary. But there is much additional evidence that such improvements as have been made in the teaching of mathematics in the past twenty-five years are in large part traceable to the Reorganization Report. It is probable that in that period not a single course of study in mathematics, which has reached the stage of being printed or mimeographed, has been promulgated without reference to the Reorganization Report for guiding principles and recommendations. It is certain that practically every book dealing with the teaching of secondary school mathematics which has been published in the past twenty-five years has emphasized the importance of this report, as have hundreds of articles which have appeared in periodicals. But perhaps the most conclusive evidence of all is to be found in prefatory statements and in the actual contents and arrangement of textbooks in high school mathematics which have been published since 1923. In the prefaces of numerous ones of these books, statements are found to the effect that "This textbook fulfills the recommendations of the National Committee on Mathematical Requirements." Prefaces, of course, are addressed to the consuming public, and statements of this nature made in the prefaces of textbooks give a pretty clear indication not only that the authors of the books have recognized the importance of the report, but that the committee's recommendations, through their influence upon the textbooks, have had far-reaching effects upon the actual classroom work in mathematics throughout the past twenty-five years.

* * *

Raleigh Schorling became a member of the National Committee on Mathematical Requirements a short time after the committee was first established. He remained

(*Continued on page 96*)

Mathematics in the Education of the Consumer

By Francis G. Lankford, Jr.
University of Virginia, Charlottesville, Virginia

Professor Schorling was deeply interested in the consumer education movement in our schools. He had keen insight into its implications for the contribution which mathematics may make to general education. This insight is clearly exhibited in two publications that bear his name as co-author. One of these is *The Role of Mathematics in Consumer Education*,[1] a report of a committee of the National Council of Teachers of Mathematics; the other is *Mathematics For The Consumer*,[2] a textbook for high school students. It, therefore, is entirely appropriate in this number of The Mathematics Teacher dedicated to the memory of Professor Schorling that the topic "Mathematics in the education of the consumer" should receive attention.

To anyone seeking to improve the mathematics curriculum in our schools, consumer education offers many possibilities. First, everyone is a consumer and, therefore, the education of the consumer must be the concern of general education. Moreover, in many of the problems of the consumer, elements of mathematics are conspicuously present. Hence, it should be helpful in curriculum planning to attempt an answer to the question: what mathematical needs does the consumer have?

First, I would list the need to see meaning in numbers and number relations. I mean, for example, ability to sense that something is wrong when a decimal has been wrongly placed in a newspaper advertisement of a sale. I mean also ability to test the reasonableness of computed answers by making estimates. Surely ability to test the reasonableness of computed answers will help young consumers to answer such questions as: How much will my annual income be increased by an hourly wage increase of 25 cents or 13 percent? How much of this will be "take home pay" and how much will be withheld in income taxes? How much will I have left if I buy an automobile, making monthly payments of $59.25?

If pupils are taught to see meaning in numbers and number relations, they will also be able to make acceptable estimates of sizes and distances. The young housewife will not buy too few yards of curtain material after measuring her windows. She will have some idea whether a tempting bargain 9×12 foot rug will look right on her living room floor. She will not just take the salesman's advice of a gallon of paint to a room, but she will estimate the surface to be covered and the amount of paint needed. Then she will decide whether to buy a gallon anyway, when she really needs only three quarts, because she can buy a gallon for $3.49 and quarts cost $1.17 each.

Second, I would suggest that our young consumers will need to be able to interpret data in order to check the conclusions of others. Here they will certainly need to understand the relationship of assumptions to conclusions as they react to the claims made in the press and on the radio, as well as television.

Such a question as: "Shall we get an overdrive with our new car?" should be decided after considering the cost in relationship to possible economy. The arithmetical problem which the consumer needs to be able to solve is:

Data Given:
$90 = cost of overdrive.
Miles per gallon of gasoline without overdrive = 18

[1] *The Role of Mathematics in Consumer Education*, The Consumer Education Study, 1201 Sixteenth Street, Washington, D. C., 1945.

[2] Schorling, Raleigh, Clark, John R., and Lankford, Francis G., *Mathematics For the Consumer*. The World Book Company, Yonkers, N. Y., 1947.

Miles per gallon of gasoline with overdrive = 22

Price of gasoline = 30¢ per gallon.

Problem: How many miles will one have to drive before he saves enough on gasoline to pay for an overdrive?

Third, they will need to know how to collect and to interpret data needed to answer a problem. Many young people should consider seriously such questions as: Can I afford a television set? or, Should we continue to rent or try to buy a home? They are undoubtedly deciding these questions without careful consideration of the facts. The result is often an excessive debt burden that may prove tragic. The high school has some responsibility to teach these people how to use numerical data in solving such personal problems, lest they continue to be the prey of persons who gain by their lack of competence.

Fourth, there is the need to make approximate computations mentally. I do not mean "short cuts" that often confuse pupils more than the longer operations they are intended to replace. Rather I mean the practice of rounding off numbers in order to make estimates. The farmer's acre is 4,900 square yards instead of 4,840. With this approximation he can compare any surface he wishes to express in acres to a square 70 yards on a side. The well-known 6 per cent method of computing interest uses a 360-day year in order to make approximate computations easy.

In many high school courses we teach pupils a cumbersome method of computing the cost of installment loans and purchases. Yet we know they will not use this operation unless we also teach them how to estimate such costs without the aid of pencil and paper.

Fifth, there is the need which maybe we should have listed as Number One: to have a *mastery* of operations with whole numbers, common and decimal fractions.

Unfortunately, our record in meeting this need is not enviable. For a generation we have known that pupils were leaving school deficient in the most basic elements of mathematical literacy. Look back over the published reports of the last twenty to thirty years and you may be surprised how long we have had extensive evidence of serious mathematical deficiencies on the part of great numbers of those who have attended our schools.

Sixth, there is the need to have confidence in and satisfaction from dealing with mathematical situations. When pupils leave our mathematics courses with a "never again" attitude, not much has been accomplished. We must, by making mathematics instruction satisfying, refute the idea that it takes a "mathematical mind" to work with such topics as common fractions and per cent in everyday affairs. It is true that a person may get along in daily life with very meager knowledge and understanding of mathematics. Many persons, lacking confidence in dealing with mathematical situations, make all kinds of clumsy substitutions for mathematical solutions. These people are the first to claim the uselessness of mathematics in everyday living. The person who has confidence in his ability to deal with relatively simple mathematics understands how his daily living is thus enriched.

Seventh, consumers need to understand and respect the nature of mathematical proof in order to use it as a daily tool. I have mentioned the importance of understanding the relationship of assumptions to conclusions in deductive reasoning. More teachers need to recognize that logical reasoning is the essence of mathematics. They need to give their pupils this contribution which mathematics has to make to their general education as well as the ability to handle operations. "Remember that the intelligent reader is a consumer of ideas as well as of food, shelter, clothing, and services."[3]

[3] *The Role of Mathematics in Consumer Education*, The Consumer Education Study, 1201 Sixteenth Street, N. W., Washington 6, D. C.

Eighth, there is the need for a thorough understanding of common mathematical concepts. Such concepts as ratio, percentage, average, discount, and rate are encountered frequently by the consumer and constitute a large part of "mathematical literacy."

At this point one may very well ask, "Aren't these also the needs which a person has for mathematics as a homemaker, as a citizen, as a wage earner, or as one who operates on a high level in any aspect of his daily living?" And the answer is "Yes." The important point for curriculum reform, however, is that problems of the consumer provide an excellent medium, though not the only one, through which these mathematical competencies may be taught, so that young people can *use them*. We have long since learned the futility of trying to develop these universally needed competencies in mathematics *before* they are used, i.e. in a kind of academic vacuum. We have much better luck when we teach them *as* they are used in solving such first hand problems as those of the consumer.

Related to the question of what are the mathematical needs of the consumer? are the questions of grade placement of the mathematical topics of consumer education and how this content shall be organized for teaching. We know that there has been much consumer education content in the general mathematics courses of grades seven, eight, and nine. In the *Role of Mathematics in Consumer Education*, Professor Schorling and his committee expressed the view that

> "Our greatest mistake has been trying to teach the mathematical topics of consumer education completely, once and for all, much too early—in the seventh and eighth grades, long before pupils were ready for them. Generally speaking the study of investments, taxation, insurance, and the like is hard to motivate for immature pupils. It is true that by special effort and laboratory techniques, the gifted and resourceful teacher can make these topics as interesting as any other unit in mathematics. However, thirteen and fourteen-year old boys and girls do not have the mathematical maturity to enable the typical teacher to do a respectable job, to say nothing of making the problem challenging. Unfortunately some curriculum specialists (including enthusiasts for consumer education) do not know that arithmetic problems may be practical and very interesting to adults and yet be deadly boring to youngsters in the seventh and eighth grades, and remote from their interests and needs."

It was proposed, therefore, that at the junior high school level we emphasize the "information" or "appreciation" aspects of the mathematical topics of consumer education and give scant attention to the computational aspects. These would be left for a *separate* course in consumer mathematics at the senior high school level when pupils will be more mature and sufficiently close to the consumer problems studied to be genuinely interested in studying them. For example, at this level many pupils will be paying income taxes on their own earnings. Many will have social security cards and many will be contemplating soon establishing a home of their own.

Recently, I visited a senior class in consumer mathematics as they dealt with the problem, "Can a young couple afford to get married on $40 a week?" Enthusiasm was high because the problem was now a very real one.

Concerning the question of how the curriculum should be organized to include the mathematical topics of consumer education much might be said. Professor Schorling and his committee have already been quoted as advocating a separate course in mathematics at the senior high school level. This was also a recommendation of the Joint Commission of the Mathematical Association of America and the National Council of Teachers of Mathematics in their 1940 report entitled *The Place of Mathematics in Secondary Education*. The more recent *Second Report of the Commission on Post War Plans* which appeared in THE MATHEMATICS TEACHER for May, 1945, contained a similar recommendation in these words.

"New and better courses should be provided in the high schools for a large frac-

tion of the schools' population whose mathematical needs are not well met in the traditional sequential courses."

"Every pupil is potentially both citizen and consumer; hence all pupils should be given some understanding of the persistent problems that confront most of our families; viz., social security, taxation, insurance, against the numerous hazards of life, and material comforts and values with a given income."

There are curriculum specialists who disagree with these recommendations for a separate course in the senior high school dealing with the mathematical topics of consumer education. Instead they think such topics should become a part of a core curriculum or common learnings program and they decry the tendency, long prevalent, to reform the high school curriculum by adding courses. There is much to be said in support of this view. A realistic position on this matter, however, must leave us concluding that the recommendation of a *separate* course in consumer mathematics is the *only* way the mathematical topics of consumer education will be included extensively in the high school curriculum for many years ahead. Indeed it may be reported that an increasing number of schools today are offering consumer mathematics courses in the senior high school years. They are demonstrating the soundness of Professor Schorling's insight into the possibilities for using mathematics for the effective education of the consumer and for improving basic mathematical competencies of *all* high school students at the same time.

Reorganization Report

(*Continued from page 92*)

a very active member until its final report was published in 1923. The first eight chapters (Part I) of the report were prepared, criticized, and eventually approved by the committee as a whole. No statement is available to indicate what individuals actually wrote these chapters, but some characteristics of style suggest that Professor Schorling may at least have had a hand in it. In any case it is certain that his work and influence had much to do with the recommendations contained in the report. Indeed, his was a double contribution. Not only did he assume his full share of responsibility and work in connection with the deliberations of the committee, but in addition to that, he conducted and reported one of the special investigations which the committee wished to have made. This investigation is published as Chapter XII of the Reorganization Report, under the title "Experimental Courses in Secondary School Mathematics."

This was no casual report. One has only to read a few of the 102 closely printed pages of Chapter XII to appreciate the immense amount of time and work and the vision and competence which went into its preparation. The penetrating insight, the ability to get immediately to key issues, and the forthright, clear-cut writing, which have come to be such well-known characteristics of Professor Schorling's work, are all in evidence. This special report which he prepared contains, in addition to two preliminary sections, separate and meticulously detailed descriptive accounts of experimental work in the teaching of mathematics then being carried on in fifteen schools in different sections of the country. There can be little doubt that this special contribution of Professor Schorling to the Reorganization Report has provided the ideas and the impetus for much of the experimental work in secondary school mathematics which has been done since that time.

A Laboratory Course in Making Visual Aids for Mathematics Education

By Raleigh Schorling
Edited by Phillip S. Jones

Preface: Early in the fall of 1948 Dr. Schorling conceived and began the planning of the laboratory course of which his description is found below. He enlisted the cooperation of Phillip Jones in organizing and administering the course, of Allene Archer as the "kick-off" speaker, demonstrator, and laboratory director for the first two weeks of the six weeks' summer session, of S. Katharine Hill as a general assistant, purchasing agent, and "greaser-of-the-wheels." Dr. Schorling secured funds for the staff and for the purchase of tools, equipment, and supplies. He also secured administrative permission to charge a five-dollar laboratory fee to be used to replace expendable materials or to buy new kinds of supplies for which a demand might develop.

The course was offered in the summer of 1949, in the spring semester of 1950, and in the summer session of 1950.

Dr. Schorling and Dr. Jones had discussed writing jointly a description of the program for the *Bulletin* of the University of Michigan School of Education. The following paragraphs bearing the date of April 3, 1950 were found in Dr. Schorling's file.

A NOVEL course is being given at the University of Michigan for prospective teachers of mathematics. It provides an opportunity to make aids that illustrate basic concepts and principles of mathematics. Although teachers of mathematics have long used such learning aids as blackboards, graphs, models, etc., the fact is that most mathematics classrooms are too barren of things—of aids that illustrate concepts and principles. The student teacher completing this course may be far too busy when he starts carrying a heavy load on his first job to make learning aids himself. However, with the information gained he should be able to so manage that each semester a few ingenious high school pupils will make them for use by the class, and thus contribute effective learning aids to the permanent equipment of the mathematics classroom.

The course was offered for the first time at the University of Michigan for experienced teachers in the summer session of 1949. Some work of this type, of course, has been done in short institutes and in several in-service programs. However, a course in the making of visual aids probably was never offered before for college credit—certainly not at the graduate level.

Each student in this course makes from five to twenty learning aids. He takes these with him and exhibits them in his classroom. Moreover, he takes with him photographs of such learning aids as are constructed by his fellow students but which he didn't have time to make. Letters from former students indicate that some classrooms have been given a "new look" by the teachers who took the laboratory course last summer.

The course is strictly a *laboratory course* from the first day to the last. There are more helpful reading materials than some teachers realize. For example, there is, of course, the Eighteenth Yearbook of the National Council of Teachers of Mathematics entitled "Multi-Sensory Aids in the Teaching of Mathematics." In addition the students spend short periods evaluating the output and discussing the utilization of each aid.

During the school year of the University of Michigan the course is offered primarily for student teachers, and they seem to find it interesting. The course meets on Saturday morning for a double laboratory period. It has one specific feature that is proving very valuable. On a given Saturday morning the teachers of mathematics from a nearby city are given a special invitation to visit the class and go to work side by side with our student teachers. On the following Saturday a group of mathematics teachers from another city

is invited, and so on throughout the semester. This working together of student teachers and teachers driving back to the University from the field is a fine experience for our student teachers.

Like any laboratory course the new course is very expensive. There are five instructors for only about twenty-five students. This semester the teachers are Raleigh Schorling, Alice Hach, S. Katharine Hill, Phillip S. Jones and Russell Schneider. Then, too, the course requires much in the way of materials and tools.

The main idea of this novel course is not too new. In fact, Thomas Jefferson stated it very neatly in a letter to George Wythe when he wrote as follows:

"I have reflected on your idea of wooden or ivory diagrams for the geometrical demonstrations. I should think wood as good as ivory; and that in this case it might add to the improvement of the young gentlemen that they should make the figures themselves."*

The following four paragraphs had been deleted by Dr. Schorling from an earlier version of the above article. They would have somewhat destroyed its unity, but we are printing them here as of value and interest in themselves and as embodying some idea of the breadth of his thinking and interests as well as of his philosophy of education.

Our experience suggests that the day may come very soon when a *general* course in audio-visual aids may be a required prerequisite for student teaching. Of course a unit of visual aids is very common as a part of student teaching or some prerequisite course, but I am disposed to think that something far more important is emerging. The right kind of course in audio-visual aids has a concomitant outcome that may be far more important than its stated objectives. A course in visual aids prerequisite for student teaching could be designed so as to be a novel and effective approach to basic problems of the curriculum and method and be nicely geared to the stage of development in which most student teachers find themselves.

In the normal school of earlier days they required us to do observation for credit as a prerequisite to student teaching. The purpose was altogether good. The trouble was that it couldn't be achieved. Our supervising teachers wanted us to have some laboratory experiences before reporting for student teaching so we were sent to see what was going on in the classrooms of the campus school. But we couldn't see very much—that is, really understand—until we had had real experiences.

Some of the reasons why observations meant so little to us is that we had to do our own interpretation and we had no valid scale of values for evaluation. Some of the things that we saw we now recognize as having been very bad for children, but at the time they looked good to us because they were so much better than the situations in which we had been pupils.

However, pedagogical maturity cannot be achieved by real experiences alone. Some of it—and a very high fraction—has to be gained by vicarious experiences; and let no one underestimate the importance of vicarious experiences. It is the only way that we can eat our cake without having it! Good literature is good literature if, as vicarious experiences, it is so vivid that it becomes a part of us. Visual aids are of course vicarious experiences; but they are of a very special kind. They are not only vivid but they can be so managed by ingenious methods that evaluation and interpretation are provided on the spot. So it may turn out that visual aids will make one of the finest contributions to teacher education, especially in providing pedagogical maturity for the beginning student teacher.

In addition to persons mentioned earlier, John Schacht, M. H. Ahrendt, and Ava Mae Seedorff each served as a visiting lecturer for a day this past summer.

Some evaluations of the success of the course and of the *incidental* values which accompanied

* Smith, D. E., "Thomas Jefferson and Mathematics." *Scripta Mathematica*, Vol. I (Sept., 1932), p. 5.

it and at times seemed among its greatest values should be noted. In 1949 this course along with all other Education School courses was rated by the students on the questions of "Value of Assignments," "Personal Value," "Would You Recommend It to a Friend?" On the scales used to represent these ratings the averages for all courses offered in the School were .65, .66, .86 respectively. The ratings of the "Laboratory Course in the Construction of Mathematics Teaching Aids" were .83, .91, and .93 respectively. Among the subjective evaluative comments made by the students some themes occurred repeatedly though in different phraseology. Examples are: "I was much impressed by the friendly and cooperative student relations and the informal class procedure." "I have profited from the exchange of teaching ideas and experiences with my classmates." "It has given me a better professional outlook on mathematics." "I have found a clarification of some mathematical principles in my own mind and have been stimulated to want to know more mathematics." "Fellowship." "Sheer enjoyment." "I have a feeling of security (in the construction and use of aids) and I plan on using the laboratory method of teaching as a result of this work." "It will strengthen the position of mathematics in our school on exhibits." "I have some ideas for giving meaning to mathematics."

Some of these comments seem to imply that informal and laboratory procedures may rate a higher place in our teacher-training program than they now receive. Perhaps we need to listen to and to respect our own words of advice about democratic procedures, laboratory techniques, and teaching for meaning which we so freely give to our student teachers.

As Others Saw Him

(*Continued from page 80*)

"Great as Dr. Schorling was in the field of education, we never were made to feel the weight of that greatness in our association with him. We were working with him rather than under him. We always felt free to go to him with our problems, knowing he would give us advice willingly and help generously. Any professional success we had was a pleasure to him, and his confidence in our ability was a support and a challenge.

"Quick to help us professionally, he was just as quick to help us personally, to rejoice with us, to sorrow with us, and to be interested in our well-being. Shortly after I came to University High School, Dr. Schorling came into my room while I was grading papers. 'What are you doing indoors when the sun is shining like this? Those papers can wait. Get outdoors!' And he waited to see that I went. His consideration for us was shown over and over again, in many ways, in the years to come.

"Those of us who are old enough to remember Dr. Schorling as he taught a junior high school class, cannot forget his understanding of children and the skillful teaching that made the pupils—oblivious of the observers around them—live in a fascinating world of mathematics. He never lost that interest in young people. The students became accustomed to having him step into a classroom to observe for a few moments. He enjoyed watching them in the corridors, was an enthusiastic supporter at athletic events, attended the school plays and operettas whenever possible, and many Friday mornings found him slipping into the back of the auditorium to listen to the student assemblies.

"The seniors in their yearbook ended their tribute to him with '. . . but above all he was the warm and loyal friend of all the teachers and pupils in our school.' Perhaps that is the tribute which he would have prized most highly."

Raleigh Schorling returned to the University of Michigan in 1924 to organize and to set up its University High School and to serve as its first principal. MRS. EDITH L. HOYLE CRAIG was a member of the original faculty which he assembled for the school. The following "reminiscences" of "R. S." and the early days of the University High School are hers.

(*Continued on page 107*)

An Evolving Bill of Rights for Teachers*

By Raleigh Schorling

In recent months newspapers, magazines, and government reports have printed convincing facts regarding the shortage of qualified teachers. The prospects of getting enough good teachers in the next decade are poor. The fact is that many able young persons now in training, who under proper conditions would prefer to teach, are rejecting teaching as a career. Salary is an issue, but there are about a dozen additional reasons why young people turn away from teaching. Most of these relate to the *working conditions* of teachers.

These various reasons why teaching fails to attract as many able young people as the schools need are listed in the following pages in a Bill of Rights for Teachers. It is hoped that a valid bill of rights will emerge from study groups in order that the public may come to realize that we will never get enough good teachers, nor will the competent teachers now in service ever be able to do reasonably efficient work until certain working conditions are improved.

Inasmuch as every boy and girl of school age is entitled to good teachers, in a very real sense the proposal is a bill of rights for youth. However, a direct attack on the problem is forthright and presumably is more likely to be understood by the public.

The Rights of a Classroom Teacher

1. *The right to teach classes that are not too large—in general, from ten to twenty pupils.*

The average class size in the schools of the armed forces for more than twelve million men and women was less than one-half of the actual class size of civilian schools in our metropolitan areas. Individual attention and proper guidance cannot be given by a teacher with oversized classes. Experts insist that crime and delinquency which now cost us, annually, at least six times what the nation pays for its schools, could be sharply reduced if teachers knew enough about their pupils and did the right things for them. A policy of small classes is economical in money and, above all, in human resources.

2. *The right to have time in the school day for planning.*

In general, the instructors in the schools of the armed forces had at least one hour to plan and to prepare for each hour of teaching. Teachers need to plan with their pupils, and with supervisors, parents, and other teachers. Planning is not possible if there is little or no time for planning, and if the people concerned cannot find the time to meet. It is not sensible for a teacher to operate hour after hour without a plan. Moreover, it is a waste of public funds. Wise observers of high school instruction have stated time and again that more than half of the pupil's time is wasted. Surely the public will want to allow a teacher of 100 pupils three hours a day for planning if by so doing fifty hours of his pupils' time can be put to better use.

3. *The right of a 45-hour week.*

In general, the teacher's week should include (a) 15 hours of teaching, (b) 15 hours of planning and pupil guidance, and (c) 15 hours devoted to sponsoring extra-

* This article appeared first in the *University of Michigan School of Education Bulletin* for May, 1946 and was later reprinted in *The Phi Delta Kappan* for January, 1947 and *Education*, January, 1947. It received favorable notice in several editorials and merits continued wide circulation amongst thinking educators. Here, in particular, it is further thought of as depicting in his own words and in a summary fashion, much of Raleigh Schorling's philosophy of education.

curricular activities, participating in community activities, and grading pupils' written work. It is extremely important for teachers to supervise student activities and to engage in community projects, but it is impossible for a teacher to maintain a high level of efficiency in his classroom if at the same time he is expected to be a social worker, a director of activities, and a guidance official. A teacher's extra work—grading papers, planning, visits to homes, etc.—cannot be left on the desk at the end of the school day. No one knows the average number of hours per week for all teachers, but it is probably much closer to 70 hours a week than it is to 45 hours.

4. *The right to an adequate amount of helpful and constructive supervision.*

The valid purposes of the right kind of supervision are (1) to help the teacher plan, (2) to aid in providing good materials and effective methods, and (3) to insure that the teacher grows on the job. In many of the schools of the armed forces an instructor was supervised from 40 to 60 per cent of the time that he taught. It is uneconomical to operate schools without good supervision. An occasional brief visit, inspectional in character, is in many cases unfair to teachers. The teacher who, day after day, does a good job, finds it difficult to maintain morale and to avoid devastating frustration when no one ever comes to see his work or to discuss his plans with him. The right kind of supervision in adequate amounts is deeply appreciated by teachers.

5. *The right to adequate compensation for the full year of fifty-two weeks.*

The average annual salary of public school teachers, principals, supervisors, and other instructional staff for the year 1944–45 is estimated at $1786, which is more than a $1000 less than the figures used for bargaining purposes in strikes that threatened the nation's economy. The teaching profession includes an astonishing number per hundred who labor with high competence and missionary zeal regardless of compensation. For that we are grateful and proud, but a million persons do not, year after year, give themselves to any calling without appropriate salary. What really happens is that many of our best prospects for teaching are attracted by better-paid jobs in industry, in commerce, and in the other professions. Witness the fact that in the three years preceding World War II the University of Michigan, a school of more than 10,000 students, recommended for certification a total of only eight teachers in chemistry and two in physics, whereas many times this number went from this university into industrial research. Society is unwittingly paying a devastating penalty when it employs persons who never should teach children merely because they are cheaper than good teachers.

6. *The right to have good materials and enough of them.*

The disposition of society toward the cost of educating for living in a peaceful world presents a sharp contrast with the attitude toward the expense of training for combat. The Army and Navy operated schools at a cost per student several times as large as the average spent per pupil in civilian schools. Thousands of mechanics were trained at an annual cost per man greater than the annual salary of the industrial arts teacher in the home school. Some of the schools of the armed forces had magnificent classrooms and laboratories such as teachers in civilian schools can scarcely imagine. Too often a teacher is expected to perform miracles, without the materials needed for the tasks. Such a teacher may have nothing in the classroom beyond a textbook—and that may be hopelessly out-of-date. School boards and administrators should each year check to insure that teachers have at least the minimum materials needed for effective work. Of especial importance are such audio-visual aids as are genuinely useful and readily available.

7. *The right to work in a room that, with the help of the students, can be made pleasant and appropriate to the tasks to be learned.*

Some industries have demonstrated that efficiency can be increased by the right working conditions. Too many classrooms give the impression of being places of detention, with little to suggest what the group is trying to do. The work of the teacher of English or mathematics, or Spanish will be easier and more effective if the atmosphere of his classroom contributes to the activities. Whenever possible the teacher should have a workroom of his own where he can arrange the settings to make them appropriate to the units of instruction. In the larger schools it is possible to avoid the wearying task of shifting disorganized materials from room to room throughout the school day.

8. *The right to the same personal liberties which other respectable citizens assume for themselves as a matter of course.*

Many of our best prospects for the teaching profession are rejecting teaching as a career because of the petty restrictions and prohibitions that many communities inflict on their teachers. These trivial but annoying requirements in personal conduct vary from community to community. Thus in one community the prohibition may be against teachers playing cards; in another, dancing on school nights; and in still another, smoking. Communities that object to a teacher attending movies are rare, but they still exist. However, the beginning teacher not uncommonly finds himself in a town in which the lawyer, doctor, businessman, priest, and minister can drink any form of liquor any time anywhere and still be held in high regard, whereas a teacher may not have his contract renewed if he drinks a single glass of beer in public. The truly professional teacher will, as a matter of course, respect the mores of his community and maintain at least as high standards as other respected citizens. A teacher with high professional zeal probably would *want* to do very few forbidden things that other citizens can do without being censored, but he certainly should have the *right* to do them. A community may well expect decency and idealism of its teachers, but it has no right to scrutinize every petty detail of their personal lives. No group of intelligent citizens in other occupations and professions would want every detail of their personal lives supervised. Teachers are only human beings and should be treated as such. At any rate it is unwise for parents to annoy teachers with trivialities. By doing so, they turn colorful vigorous personalities away from the teaching profession and thus deprive their own children of teachers who might provide strong leadership for high ideals.

9. *The right to an externship.*

No institution of teacher education can turn out a finished product. Yet seldom is the beginning teacher given a light assignment and an adequate amount of supervision. Indeed he is lucky if he does not draw the heaviest load and the most disagreeable tasks.

The solution to the problem of the beginning teacher is the idea of externship. This idea, so vital in medical education, has long been advocated in teacher education and is generally approved, but seldom found in practice. The nature and character of the period of externship is suggested by the following provision: (1) a light teaching load in the first yer of teaching —perhaps half-time; (2) salary appropriate to the load, ideally a living wage for a single person; (3) experience in a great variety of tasks, as for example extracurricular, administrative, and teaching; (4) adequate and competent supervision; (5) an opportunity to study the school and community as a "whole" before being limited to the teaching of a single subject or grade; (6) an arrangement truly professional which guarantees that the externship concept will not be used as a means of hiring a cheap teacher to replace a more expensive but experienced teacher; and (7)

the use of gifted teachers with special interest in professional problems to supervise beginning teachers, allowing them time in the school day to do the job and extra compensation for this valuable and technical service.

10. *The right to a realistic program of in-service education.*

By in-service education we mean training on the job. The experienced teacher from time to time needs to revise materials and methods. The in-service program should be geared to a competent department of research that will keep materials and techniques up to date without too much grief and waste of effort. Precious time and energy are now wasted by groups of tired teachers who, after school at the end of a long and weary day, are expected to revise the curriculum. Witness the fact that 85,000 courses of study, created largely by scissors and paste techniques, have been filed in the curriculum collection at Teachers College, Columbia University, and that only a few can be rated as helpful. Boards of education must come to realize that keeping the curriculum up to date is a difficult and technical task which, if attempted at all by teachers, must be done in the school hours of the work day and not in overtime periods without compensation.

11. *The right to participate in modifying the curriculum and methods, and in formulating school policies.*

Sound administration of schools will utilize the constructive ideas of all teachers to make sure that the service of the school to its pupils may be made as good as possible, and to insure that a teacher will grow on the job.

12. *The right to keep from being lost in the profession.*

Many excellent teachers are lost in the vast numbers who, with relatively little ability, training, and experience, come and go. There is no systematic provision for continued recognition of growth in the service. All are teachers! There is little differentiation that recognizes competence or length of service except by meager annual increments of increase in salary. To no small degree the gifted teacher is always in competition with all newcomers, however incompetent. Even the members of a strong school board may not be aware that they have especially fine teachers in their schools. Mere financial rewards are not sufficient to maintain morale. A good teacher has the right to be identified by professional recognition that will strengthen his hand in dealing with the public and the pupil. Such machinery for differentiation between the professional worker and the mere transient does not now exist. However, gifted teachers may reasonably look to their professional organizations for the design of a system of identification that is long overdue.

Raleigh Schorling

"If Professor Schorling's proposals, and similar ones by other educators, are approved, the teachers will have an adequate Bill of Rights to cover their profession. It is time that the teaching profession received its own Magna Carta."—FINE, BENJAMIN, "Teaching Career Entails Handicaps," *New York Times*, February 13, 1947, p. 27.

Raleigh Schorling—A Bibliography

Books

OF THE fifty-nine books bearing Raleigh Schorling's name, forty-four are secondary school mathematics texts, seven deal with the teaching of mathematics, five are concerned with student teaching in general and three with still more general educational questions.

With three exceptions the mathematics texts were written with John R. Clark (and others) and were published by the World Book Company in the interval from 1922 through 1950. The three exceptions are his first two books:

A Review of High School Mathematics (with Reeve). Chicago: The University of Chicago Press, 1915. pp. x plus 70.

General Mathematics (with Reeve). Boston: Ginn and Company, 1919. pp. xvi plus 488.

and the text which he prepared for the Navy during World War II:

Mathematics (Prepared for Standards and Curriculum Division, Bureau of Naval Personnel). U. S. Government Printing Office, Washington, D. C., 1945. pp. vii plus 527.

His World War II service to our government also included:

Review Arithmetic, Practice Books 1 and 2 (with Clark, Potter, Deady). Army Institute Bulletins No. 510.3, 511.4. Yonkers, New York: World Book Company, 1943. pp. 44 and 60.

In the field of the teaching of mathematics the following titles may be listed:

A Contemporary Guide in the Teaching of Arithmetic (edited by Raleigh Schorling, J. R. Overman, and W. O. Shriner). Ann Arbor, Michigan: Edwards Brothers, 1933. pp. v plus 126.

A Contemporary Guide in the Teaching of Junior High School Mathematics (edited by Raleigh Schorling, John P. Everett, and Walter O. Shriner). Ann Arbor, Michigan: Edwards Brothers, 1933. pp. viii plus 122.

Contemporary Guide in the Teaching of Arithmetic, Grades One to Four (edited by Raleigh Schorling, Walter O. Shriner, and Olive Tilton). Second Experimental Edition. Ann Arbor, Michigan: Edwards Brothers, 1934. pp. 169.

Contemporary Guide in the Teaching of Arithmetic, Grades Four to Eight (edited by Raleigh Schorling, Walter O. Shriner, and Olive Tilton). Second Experimental Edition. Ann Arbor, Michigan: Edwards Brothers, 1934. pp. 130.

Contemporary Guide in the Teaching of Arithmetic, Grades One to Eight (edited by Raleigh Schorling, Walter O. Shriner, and Olive Tilton). Second Experimental Edition, Ann Arbor, Michigan: Edwards Brothers, 1934. pp. 169.

Contemporary Guide in the Teaching of Junior High School Mathematics (edited by Raleigh Schorling, John P. Everett, and Walter O. Shriner). Second Experimental Edition. Ann Arbor, Michigan: Edwards Brothers, 1935. pp. 121.

The Teaching of Mathematics—A Source Book and Guide. Ann Arbor, Michigan: The Ann Arbor Press, 1936. pp. viii plus 247.

In addition to the latter book and the one prepared for the Navy, the third book to bear his name alone, and the book for which he was probably best known in fields outside of mathematics was:

Student Teaching. New York: McGraw-Hill Book Company, 1940. pp. xiii plus 329.

A second edition of this work was published in 1949, and it was in a sense supplemented and completed by the book which came off the press after his death, the last book to bear his name; namely,

Elementary School Student Teaching (with G. Max Wingo). New York: McGraw-Hill Book Co., Inc., 1950.

Motion Pictures

The five outstanding educational sound movies which he designed and helped to produce were planned to accompany and supplement *Student Teaching.* They were:

Learning to Understand Children Part I and slide film, distributed by McGraw-Hill Publishing Company, and Loew's International Incorporated, New York, 1947.

Learning to Understand Children Part II and slide film, distributed by McGraw-Hill Publishing Company, and Loew's International Incorporated, New York, 1947.

Maintaining Classroom Discipline and slide film, distributed by McGraw-Hill Publishing Company, and Loew's International Incorporated, New York, 1947.

Broader Concept of Method Part I and slide film, distributed by McGraw-Hill Publishing Company, and Loew's International Incorporated, New York, 1947.

Broader Concept of Method Part II and slide film, distributed by McGraw-Hill Publishing Company, and Loew's International Incorporated, New York, 1947.

Monographs

Seven of the twelve monographs with the production of which he was closely associated dealt with some phase of the teaching of mathematics. These were:

Reorganization of Mathematics in Secondary Education (with Young, *et al.*). A Report by the National Committee on Mathematical Requirements. Published by the Mathematical Association of America, Inc., 1923. pp. x plus 652.

A Tentative List of Objectives in the Teaching of Junior High School Mathematics—With Investigations for the Determining of their Validity. Ann Arbor, Michigan: George Wahr, 1925. pp. vii plus 137.

"First Report of the Commission on Postwar Plans" (with Wren, *et al.*). THE MATHEMATICS TEACHER, May, 1944. pp. 226–232.

"Second Report of the Commission on Postwar Plans" (with Wren, *et al.*). THE MATHEMATICS TEACHER, May, 1945. pp. 195–221.

The Role of Mathematics in Consumer Education. Washington, D. C.: The Consumer Education Study, 1945. pp. 23.

Manpower for Research, Volume Four of *Science and Public Policy*, A Report to the President by John R. Steelman, Chairman, President's Scientific Research Board, 1947. U. S. Government Printing Office. pp. 47–150.

Guidance Pamphlet in Mathematics for High School Students (with members of the Commission on Postwar Plans). THE MATHEMATICS TEACHER, November, 1947.

Research Studies

In research Raleigh Schorling's great interest in and contribution to mathematics education is evidenced by the following twelve studies. (He also produced a more general study of "The Techniques of Textbook Authors" and one dealing with procedures to be used with dull-normal children.)

"The Problem of Individual Differences in the Teaching of Secondary School Mathematics," *School Review*, XXIII (October and December, 1915), 535–49, 649–64.

"Course of Study in Secondary Mathematics in the University High School, The University of Chicago" (with Breslich and others), *School Review*, XXIV (November, 1916), 648–74.

"Terms and Symbols in Elementary Mathematics" (with Young and others), THE MATHEMATICS TEACHER, XIV (March, 1921), 107–18.

"A Program of Investigation and Cooperative Experimentation in the Mathematics of the Seventh, Eighth, and Ninth School Years" (with Clark), THE MATHEMATICS TEACHER, XIV (May, 1921), 264–75.

"Experimental Courses in Secondary School Mathematics," THE MATHEMATICS TEACHER, XV (February, 1922), 63–78.

"Experimental Courses in Secondary School Mathematics," *Reorganization of Mathematics in Secondary Education*, Chapter XII. Mathematical Association of America, Inc., 1923.

"An Investigation in the Teaching of the Skills of Ninth Grade Algebra" (with Lindell), *School Science and Mathematics*, XXV (November, 1925), 813–16.

"Report of the Sub-Committee on Junior High School Mathematics," *North Central Association Quarterly*, II (March, 1928), 396–419.

"The Need for Being Definite with Respect to Achievement Standards," THE MATHEMATICS TEACHER, XXIV (May, 1931), 311–29.

"Preliminary Report of the Committee on Individual Differences," THE MATHEMATICS TEACHER, XXV (November, 1932), 420–26.

"Report of the Committee on Individual Differences," THE MATHEMATICS TEACHER, XXVI (October, 1933), 350–65.

"Mathematics," The Curriculum, Chapter J., *Review of Educational Research*, II (April, 1934), 168–71.

Journal Articles

Dr. Schorling's complete bibliography has eighty-one entries under this heading. The thirty-five which dealt with mathematics education are listed here. The others dealt with many educational topics but with particular emphasis on the curriculum and on teacher training.

"A Mathematics Contest—Its Relation to the General Problem of Individual Differences," *School Science and Mathematics*, XV (December, 1915), 794–97.

"The Place of Mathematics in the 'Secondary Schools of Tomorrow'" (with others), *School Science and Mathematics*, XVI (October, 1916), 608–16.

"Significant Movements in Secondary School Mathematics," *Teachers College Record*, XVIII (November, 1917), 438–57.

"Elective Courses in Mathematics for Secondary Schools" (with Young and others), THE MATHEMATICS TEACHER, XIV (April, 1921), 161–70.

"College Entrance Requirements in Mathematics" (with Young and others), THE MATHEMATICS TEACHER, XIV (May, 1921), 224–45.

"The First Yearbook of the National Council of Mathematics Teachers—An Announcement," *School Science and Mathematics*, XXV (November, 1925), 871–72.

"Suggestions for the Solution of an Impor-

tant Problem That Has Arisen in the Last Quarter of a Century." *First Yearbook of the National Council of Teachers of Mathematics*, 1926. pp. 58–105.

"A Discussion of General Mathematics," *The Junior High School Curriculum*, pp. 185–91. Fifth Yearbook of the Department of Superintendence. Washington: National Education Association, 1927.

"General Mathematics," THE MATHEMATICS TEACHER, XX (February, 1927), 65–81.

"The Story of Geometry," *Plane Geometry* by Joseph P. McCormack, pp. 359–66. New York: D. Appleton and Company, 1928.

"Notes on the Status of Standardized Tests in Demonstrative Geometry," *Journal of the Michigan Schoolmasters' Club*, 1928. University of Michigan Official Publication, XXX, No. 22, pp. 154–62.

"Research in High School Mathematics" (with Breslich and Johnston). *The Development of the High School Curriculum*, pp. 328–43. Sixth Yearbook of the Department of Superintendence. Washington: National Education Association, 1928.

"How Shall the Objectives of Mathematics for the Secondary Schools Be Determined?" *Junior-Senior High School Clearing House*, V (February, 1931), 336–40.

"Report of the Committee on Individual Differences," THE MATHEMATICS TEACHER, (October, 1933). pp. 350–65.

"The Contribution of Mathematics to Sensible Integration," *University of Michigan School of Education Bulletin*, IX (May, 1938), 118–21.

"Social Mathematics for the Senior High School," *University of Michigan School of Education Bulletin*, X (March, 1939), 85–87.

"Social Mathematics for the Senior High School," *The Oklahoma Teacher*, XXI (September, 1939), 13–14.

"Mathematics in General Education," *School Science and Mathematics*, XL (January, 1940), 14–26.

"Social Mathematics for the Senior High School," *Bulletin of the Kansas Association of Teachers of Mathematics*, XLI (December, 1941), 25–27.

"Vitalizing Mathematics with Applications from Aviation," *University of Michigan School of Education Bulletin*, XIV (November, 1942), 21–24.

"Trends in Junior High School Mathematics," THE MATHEMATICS TEACHER, XXXV (December, 1942), 339–48.

"High School Science and Mathematics in Relation to the Manpower Problem" (with Havighurst, *et al.*), A Report of the Cooperative Committee on Science Teaching. *School Science and Mathematics*, XLIII (February, 1945), 126–56.

"Pre-Induction Courses in Mathematics," Report of the National Commission. THE MATHEMATICS TEACHER, XXXVI (March, 1943), 114–24.

"The Need for Cooperative Action in Mathematical Education." *American Mathematical Monthly*, LII, 4 (April, 1945), 194–201.

"What's Ahead in Secondary School Mathematics?" *Looking Ahead in Education*, Ginn and Company (1945), 115–23.

"The Preparation of High School Science and Mathematics Teachers," Report No. 4. The AAAS Cooperative Committee on Science Teaching. *School Science and Mathematics*, (February, 1946), 107–18.

"The Crisis in Science and Mathematics Teaching." *School Science and Mathematics* XLVII, 5 (March, 1947), 413–20.

"Mathematics—Grades One to Twelve." *The Science Teacher*, (April 1948), 59–60.

"What's Going on in Your School?—A Mathematics Inquiry." THE MATHEMATICS TEACHER, XLI (April, 1948), 147–53.

"A Program for Improving the Teaching of Science and Mathematics." *The American Mathematical Monthly*, Vol. 55 (April, 1948), 221–37.

"Let's Come to Grips with the Guidance Problem in Mathematics." THE MATHEMATICS TEACHER, XLII (January, 1949).

"Course in Arithmetic—Should all High School Freshmen be Required to Take a Course in Arithmetic?" *Nation's Schools*, Vol. 43, No. 4 (April, 1949).

"Mathematics—Grades One to Twelve." *The American Biology Teacher*, Vol. 11 (January, 1949), 16–18.

"Mathematics in General Education." *School Science and Mathematics*, XLIX, 4 (April, 1949), 296–301.

"Experimental Mathematics Program for College Preparatory Students." The California Mathematics Council Bulletin, VII, 2 (November, 1949), 10–13.

Tests, Check Lists, and Workbooks

A total of thirty-two items of the above nature, twenty-nine of which were related to mathematics education, were produced by Dr. Schorling in collaboration with Clark, Rugg, Potter and a few others.

Pamphlets

In addition to the five items listed below, Dr. Schorling helped produce two non-mathematical Lincoln School pamphlets, seven unit pamphlets under the general heading of *Mathematics in Life*, and four others bearing the general title *Social Mathematics* published by the World Book Company.

Illustrated Mathematical Talks by Pupils of the Lincoln School (with Woliung and others). New York City: The Lincoln School of Teachers College, 1919. pp. 44.

The Reorganization of the First Courses in Secondary School Mathematics (with Young and

others). A Preliminary Report by the National Committee on Mathematical Requirements. U. S. Bureau of Education Secondary School Circular, No. 5, February, 1920. Washington: Government Printing Office. pp. 11.

Junior High School Mathematics (with Young and others). A Preliminary Report by the National Committee on Mathematical Requirements. U. S. Bureau of Education Secondary School Circular, No. 6, July, 1920. Washington: Government Printing Office. pp. 10.

The Problem of Mathematics in Secondary Education (with Kilpatrick and others). A Report of the Commission on the Reorganization of Secondary Education Appointed by the National Education Association. U. S. Bureau of Education Bulletin, 1920, No. 1. Washington: Government Printing Office. pp. 24.

An Outline of Essentials in Junior High School Mathematics (Mathematics Department, University High School). Bureau of Educational Reference and Research, University of Michigan. April, 1929.

As Others Saw Him

(Continued from page 99)

"It was a great challenge to be a member of the University High School Faculty at Ann Arbor, Michigan when the school opened with Raleigh Schorling as its principal. We spent long hours under his leadership arguing, rejecting, recasting, and finally formulating and accepting ideals, standards, and philosophies for the new school. During those long sessions he challenged us constantly with such questions as these: 'If we do it that way will it make this school a good place for girls and boys to be?' 'Even if it is all right for this once, will it be a good tradition to set up?' 'What will its long time effect be on the individual pupil?' 'Will it be a worthwhile educational experience?' He never dictated but slowly and in a democratic way he led us to formulate our plans for the 'education of the whole child.'

"Dr. Schorling also showed great faith in the pupils. Time and again he called an 'Assembly of the Whole' to discuss some problem with them. They were given the opportunity and the educational experience of thinking the problem through and trying to find a solution that would be best for all concerned.

"His friends and fellow workers can testify to his quick and genuine sympathy for one who was in trouble. We will always remember the many kind and thoughtful things he did for us. If we were ill or bereaved he always urged the extra day or week to 'get really strong again.'

"Perhaps one of the best things that he did for his pupils and teachers was to expect a much higher type of work of them than they knew that they could do. Then when the task was accomplished he never failed to offer quick words of praise. One of my most satisfactory moments in University High School was when I found a note in my box at the conclusion of our first Christmas program. I had helped to write and had directed the play given that day. The note said, 'You have written yourself deeply into the heart of University High School today,' and it was signed 'R. S.'

"He always held that children and young people should not be sheltered from knowledge of and contact with those who were suffering from some misfortune. He said that poverty, sickness, death, race problems, mental ineptitude, and social maladjustments were all part of life's problems, and working and playing with those who were afflicted by them should be part of the educational plan. Therefore, during the school's first year, he accepted a girl who was subject to epilepsy, a rather bad spastic case, a Negro girl, three German refugees from World War I, several maladjusted pupils, as many children as he could get from the low economic group, and one overgrown seventeen year old boy with an I.Q. of about 80, but who also had a large diamond ring, a Chrysler

(Continued on page 134)

THE PRESIDENT'S PAGE

One of the most important activities of the National Council is arranging national meetings and providing good programs for them. These meetings cannot succeed without the support of local teachers in and around the place of meeting. Making local arrangements for these meetings is a huge task for local committees, all of whom serve without pay and little enough praise for the work they do. Although participants on these programs donate their services and take care of their own expenses, our programs are highlighted by outstanding leaders from our own and related fields, from school administration and supervision, and from business and industry. We are very proud of the fact that our meetings attract these leaders and that we are able to secure their services. In addition, the meetings are planned to give the classroom teacher a prominent place on the program and also to provide places for promising younger people. We aim to make these meetings of value to all teachers of mathematics from elementary through college, also to supervisors and administrators. Providing good meetings is one of the most valuable services of the Council.

As you know, we have several meetings of the National Council each year in various parts of the country, in places where we are invited and are assured of the necessary local support. Our annual meeting is held in the early spring, usually in April. The twenty-ninth *annual* meeting will be in Pittsburgh on March 28 to 31. The complete program of this meeting is in this issue of The Mathematics Teacher. The eleventh Christmas meeting was held last December on the campus of the University of Florida. The 1951 Christmas meeting will be at Oklahoma A. and M. College. The place of the 1952 annual meeting has not yet been decided. Since the National Council has become a department of the NEA, we conduct a one-day meeting as a part of their annual convention which is held during the first week in July. The 1950 meeting with the NEA was held in St. Louis, the 1951 meeting will be in San Francisco.

While we have conducted only one Christmas meeting and one summer meeting each year, other than the one-day meeting with the NEA in July, I see no reason why we could not have more, providing these meetings are so located as not to conflict with one another. Any region desiring a summer meeting or a Christmas meeting of the National Council should make this known to us. If proper local support for these meetings can be assured, it might be well to have them. However, these same regions might prefer to have a mathematics institute or workshop. I look with great favor on mathematics institutes. A few very successful ones have been going for years and several new ones have been recently started. The idea of the mathematics institute has been growing and I think it should. If your region would be interested in having a mathematics institute, we would be glad to hear from you. Also, we would be glad to hear about mathematics institutes and workshops that are now in progress or are being planned.

We invite your suggestions on how to improve our National Council meetings. Note that we are instituting *continuity sections and discussions* at the Pittsburgh meeting. This has been done because of the demand for "more continuity" in our programs. The National Council meetings must serve the needs and desires of the mathematics teachers; giving them inspiration as well as information, affording them the opportunity of hearing from the leaders in the field, and allowing them the opportunity of exchanging ideas on teaching practices. The primary purpose of our meetings must be to help promote better teaching of mathematics.

H. W. Charlesworth, *President*

Revision of By-Laws

National Council of Teachers of Mathematics (Incorporated)

CHANGES in the plan for the editing and business management of THE MATHEMATICS TEACHER recently adopted by the Board of Directors, the affiliation of the Council with the National Education Association, and the formation of a delegate assembly made changes in the By-Laws of the Council advisable. The Board of Directors therefore authorized a committee to study the By-Laws and propose changes to be voted on at the business meeting of the Council to be held in Pittsburgh this spring.

Members of the committee are George Hawkins, Lyons Township High School and Junior College, La Grange, Illinois; Mary Potter, Board of Education, Racine, Wisconsin; and Marie S. Wilcox, Chairman, George Washington High School, Indianapolis, Indiana.

The present By-Laws may be found in the October, 1949 issue of THE MATHEMATICS TEACHER. Printed below are the revised By-Laws as recommended by the committee.

PROPOSED BY-LAWS

ARTICLE I

NAME, PURPOSE, AND CORPORATE SEAL

1. This organization shall be known as the National Council of Teachers of Mathematics (Incorporated).

2. Its object shall be to assist in promoting the interests of mathematics in America, especially in the elementary and secondary fields, by holding meetings for the presentation and discussion of papers, by conducting investigations for the purpose of improving the teaching of mathematics, by the publication of papers, journals, books, and reports, thus to vitalize and coordinate the work of many local organizations of teachers of mathematics and to bring the interests of mathematics to the attention and consideration of the educational world.

3. This organization shall be a department of the National Education Association.

4. The corporate seal of the Council shall have inscribed thereon the name of the organization and the words "Corporate Seal—Illinois."

ARTICLE II

MEMBERSHIP

1. Any person who is interested in the field of mathematics shall be eligible to membership in the Council.

2. The Board of Directors may establish various types of membership in the Council and determine the fee for each. Each member is entitled to receive THE MATHEMATICS TEACHER.

ARTICLE III

OFFICERS, BOARD OF DIRECTORS, COMMITTEES

1. Officers. The officers of the Council shall be a president, four vice-presidents, a recording secretary, an executive secretary, and an editor.

2. Qualifications. A nominee for president must have been a member of the Board of Directors within the preceding five years.

The four vice-presidents shall represent the Elementary, Junior High School, Senior High School, and College fields.

3. Election, tenure of office, compensation. The president and vice-presidents shall be elected by members of the Council.

The president shall serve for two years and shall not be eligible for re-election.

Two vice-presidents shall be elected each year. Each shall serve for two years and shall not be eligible for re-election.

The Executive Secretary, Recording Secretary, and Editor shall be appointed by the Board of Directors. The Executive Secretary shall be appointed for a term of three years; he may be reappointed. The Editor shall be appointed for a term of three years; he may be reappointed but shall not serve for more than two consecutive terms. The Recording Secretary shall be appointed for a term of one year; he may be reappointed.

4. Compensation. Compensation, if any, for officers shall be fixed by the Board of Directors.

5. Duties of officers.

(1) President. The President shall be the executive officer of the Council. He shall preside at all meetings of the Board of Directors and at the annual business meeting of the Council. He shall have the usual duties pertaining to his office and such other duties as may from time to time be assigned him by the Board of Directors.

(2) Vice-Presidents. A vice-president shall, in the president's absence or inability to serve, have and exercise the powers of the president. Of the two vice-presidents who are serving their second year, the one having received the larger number of votes at the time of election shall assume the responsibilities of the president.

(3) Recording Secretary. The Recording

Secretary shall keep a record of the proceedings of all business meetings of the Council and of the Board of Directors.

(4) Executive Secretary. The Executive Secretary shall, working under the direction of the President, endeavor to carry out the policies formulated by the Council, the Board of Directors, and the Executive Committee. He shall serve as treasurer and business manager of the Council.

(5) Editor. The Editor shall be responsible for the official journal in all phases except that of business management.

(6) Board of Directors. The Board of Directors shall consist of 14 voting members: the President, four Vice-Presidents, and nine Directors. The immediate past president shall be a non-voting member of the Board.

The nine Directors shall be elected by members of the Council according to a geographic plan determined by the Board. Three shall be elected each year and shall serve for a term of three years or until their successors are elected. They shall be eligible for re-election but shall not serve for more than two consecutive terms.

The Board of Directors shall have general supervision of the activities of the Council, shall supervise the expenditure of funds, fix salaries and bonds of officers, and fill vacancies ad interim in any office.

7. Executive Committee. The Executive Committee shall consist of the president and two members of the Board which shall be appointed by the President with the approval of the Board.

This committee shall act for the Board of Directors when so instructed by that body and shall act in an advisory capacity to the President and the Executive Secretary.

8. Standing Committees. The standing committees shall be Auditing, Budget, Nominations and Elections, Year Book Planning, Supplementary Publications, and such other committees as shall be authorized from time to time by the Board of Directors. These committees shall be appointed by the President subject to the approval of the Board.

9. Duties of Committees.

(1) The Auditing Committee shall make an annual audit of the books and accounts of the Executive Secretary.

(2) The Budget Committee shall prepare an annual budget for the Council to be submitted to the Board of Directors at the time of the annual meeting.

(3) The Nominations and Elections Committee shall cause an announcement to be published in the official journal at least five months before the annual meeting inviting members of the Council to suggest nominees for elective offices. It shall place in nomination at least two persons for each elective office and shall instruct the Executive Secretary to mail ballots to all members at least one month before the annual meeting. A date for the closing of the balloting shall appear on the printed ballot.

(4) The Year Book Planning Committee shall serve as a planning committee for all Year Books. This committee shall recommend to the Board of Directors, at least two years in advance of the anticipated publication date, a topic and a board of editors for the publication of each book.

(5) The Supplementary Publications Committee shall supervise the editing and publication of all publications other than Year Books and the official journal.

10. Editorial Board. The Editorial Board shall consist of the Editor and six associate editors. The associate editors shall be appointed for a term of three years by the Board of Directors on recommendation of the Editor. They shall be eligible for reappointment but shall not serve for more than two consecutive terms.

ARTICLE IV

Meetings, Quorums, Rules of Order

1. The business meeting of the Council shall be held annually, at such time and place as the Board may direct. Special meetings of the Council may be called by the President under the authorization of a majority of the members of the Board of Directors.

2. The Board of Directors shall hold at least two meetings at the time of the annual meeting, one preceding and one following the annual business meeting of the Council. Additional meetings of the Board may be held at the call of the president under the authorization of a majority of the members of the Board.

3. Notice of any meeting of members of the Council shall be given by the Executive Secretary at least thirty days prior to the date set for said meeting. Notice of any meeting of the Board other than regular meetings herein provided shall be given to each member of the Board at least fifteen days prior to the date set therefor.

4. At any meeting of the Council a quorum shall consist of twenty-five members.

5. Eight members of the Board of Directors shall constitute a quorum for the transaction of business.

6. Roberts Rules of Order Revised shall govern the conduct of all business meetings of the Executive Committee, Board of Directors, and the Council.

ARTICLE V

Affiliated Groups

1. Any organized group of teachers of mathematics may petition the Board of Directors to become affiliated with the Council. The Board shall specify the conditions under which such affiliation may take place.

2. An affiliated group shall be entitled to send a delegate to the Delegate Assembly.

3. The Delegate Assembly shall be composed of representatives from affiliated groups. The Assembly shall hold a meeting at the time of

(*Continued on page 114*)

Candidates for N.C.T.M. Offices—1951 Ballot

THE 1951 Nominating Committee presents the persons listed below as candidates for the designated offices on the Board of Directors along with a brief biographical sketch of each. Two candidates are presented for each office to be filled. The names are listed in alphabetical order.

Every name which was submitted in time was considered by every member of the Committee. Many excellent suggestions were received but the offices were so few that not nearly all of the names could be used. The present Nominating Committee will turn all this material over to next year's Committee for their consideration.

On behalf of the Nominating Committee, I would like to thank the many members of the Council who sent in recommendations for the ballot.

ONA KRAFT
Collinwood High School
Cleveland, Ohio

Vice President—College Mathematics

KARNES, HOUSTON T., Louisiana State University, Baton Rouge, La. A.B., Vanderbilt

HOUSTON T. KARNES

U., A.M.; Ph.D., Peabody Coll.; summer sessions, U. of Michigan and U. of Wisconsin. Prof. math. and biol., Northwestern Junior Coll., Orange City, Ia., 1929–35; prof. and head of math. dept., Harding Coll., 1935–36; tchr. and dept. head, Nashville, Tenn. City High Schools, 1936–38; tchg. fellow, Peabody Coll., summers 1937, 1938, and 1939; assoc. prof. of math., Louisiana State U., 1938–. Member: N.C.T.M.; Math. Assn. of Am.; Am. Math. Soc.; N.E.A.; La. E.A.; Pi M.E.; K.M.E.; P.D.K.; K.D.Pi; O.D.K.; Lambdi Chi Alpha, International Pres.; Bd. of Trustees, Harding Coll.; A.A.U.P.; appeared on programs of N.C.T.M.; chm. NCTM Com. on Contests and Scholarships; member of M.A.A. Comm. on Math. Institutes; listed in American Men of Science. Contrib. to Math. Tchr., Am. Math. Monthly, Nat. Math. Mag., Lousiana Schools, including "Junior College Mathematics in View of the President's Report," Math. Tchr., Apr. 1950; "Education vs. Legislation," Am. Math. Monthly, Oct. 1950.

ZANT, JAMES H., Oklahoma A. and M. College, Stillwater, Okla. A.B., Southern Metho-

JAMES H. ZANT

dist U.; A.M. Columbia U., Ph.D. Assoc. prof. of math., Southeastern S.T.C., Durant, Okla., 1923–30; prof. of math., Oklahoma A. and M. Coll., 1930–, act. hd. 1942–46, prof. and asst. hd., 1946–; Dir. of Instruction Okmulgee Br., Okla. A. and M. Coll., 1946–48. Member: N.C.T.M. (Board of Dir. 1948–), Math. Assn. of Am., Am. Soc. of Eng. Edn., A.A.U.P., Okla. Acad. of Sci., P.D.K., K.D.Pi., Pi M.E., S.A.E., listed in Am. Men of Sci. and Who's Who in Central States. Author: "Elem. Math. Concepts," 1940; "Teaching Plan for Unit of Work in Math.," 1935; "Basic Mathematics, A Workbook" (with M. W. Keller); "Coll. Al. and Trig." 1949; "Papers on Vocational Opportunities for Students of Mathematics," Bull. Okla. A. and M. Coll. Apr.1946; "The Engineering Staff's Responsibilities and Opportunities in the Improvement of Learning and Teaching Mathematics in the Secondary School," Math. Tchr., Mar., 1948; "Professional Engineers and Engineering Education," Okla.

Prof. Eng., Nov., 1947; "Guidance Report of the Commission on Post-War Plans," Math. Tchr., Nov., 1947; "What Are the Mathematical Needs of the High School Student?", Math. Tchr., Feb., 1948; "A Program for Determining the Mathematical Needs of Engineering Students," Math. Tchr., Mar., 1950; "The United States Armed Forces Institute Examinations in Mathematics as a Means of Determining Credit in Engineering Mathematics," Jour. of Eng. Educ., Nov., 1945; "The Next Step in Planning for Post-War Mathematics," Math. Tchr., Oct., 1945; "Importance of Mathematics in Post-War Planning," Okla. Tchr., Feb., 1945; "Need to Improve Courses in Mathematics," Okla. Tchr., Nov., 1945; "Differentiating Courses in Secondary Mathematics According to Pupil Needs," Bull. of the Kans. Assn. of Tchrs. of Math., Dec., 1945; "Vocations Available for College Students of Mathematics," Proc. Okla. Acad. Sci., 1945; with J. Vincent Robison, "The Pre-Engineering Inventory Tests for Engineering Students of the Okla. A. and M. Coll.," Proc. Okla. Acad. Sci., 1945. "Guidance in the Field of Mathematics for High School and College Students," The Pentagon, Spring, 1946; "The Improvement of High School Mathematics Courses as Recommended by the Commission on Post-War Plans," Math. Tchr., Oct., 1946.

Additional Members of Board of Directors
Three to be elected

GAGER, WILLIAM A. University of Florida, Gainesville, Fla., B.S., M.S., Penn State Coll.;

WILLIAM A. GAGER

Ph.D., Peabody Coll. for Tchrs. Instr. in Eng., Penn. State Coll., 1919–23; tchr. of math. and sc., St. Petersburg H.S., 1926–27; head of math. dept., St. Petersburg Jr. Coll., 1927–42; summer tchg., Peabody Coll., 1936–39; assoc. and full prof. of math. at U. of Florida, 1942–; math. consult. Fla. St. Dept. of Educ., 1940, 42, 48, 49, 50; chairman of Fla. Curr. Com. 1947–50; chairman of math. clinic for state supervisors conference, 1948; dir. of state dept. study of math. in sec. schools of Fla., 1947–49; editor-in-chief of Duke Math. Inst. High Lights, 1948, 1949, 1950; ed. and dir. of State Dept. Bull. No. 40 and Bull. No. 36; assoc. ed. of Math. Tchr. 1950–; dir. of Fla. Council of Tchrs. of Math., 1950. Member: N.C.T.M., C.A.S.M.T., Math. Assn. of Am., Fla. Acad. of Sc., Fla. Ed. Assoc., Fla. Public Health Assoc., A.A.U.P., P.D.K., K.D.Pi, P.K.P., T.B.Pi, Theta Chi, listed in Who's Who in Am. Ed., 1945–51, Am. Men of Sc., 1949–51. Author: "Terminal Business Math. in the Jr. Coll.," 1940; "Mathematics for the War Effort," 1942; "Proper Appreciation and Correct Understanding of Mathematics" F.E.A., 1935; "Computation with Approximate Numbers," S. S.M., 1947; "Mathematics for the Other Eighty-five Per cent," S.S.M., 1948; "Aiding Students in Acquiring Basic Concepts," Duke H.L., 1949; "A Functional Program for Secondary Mathematics," M.T., 1949; "Quality Control in Secondary Mathematics," Duke H.L., 1950; "Concepts for Certain Mathematics Courses," S.S.M., 1950.

HALL, LUCY E., Wichita High School North, Wichita, Kan. A.B., U. of Kan.; M.A., Tchrs. Coll., Columbia U.; Summer sessions at Denver U., Wichita U., and U. of Chicago; attended Inst. of Foreign Affairs at American U., 1948.

LUCY E. HALL

All teaching experience in Kansas, a few years in the elementary grades, a few years in junior high school but the greater part in senior high school, always in mathematics work; head of math. dept. Wichita H.S. North, 1943–. Pres. of Wichita Math. Assoc.; local co-chairman of 10th Christmas meeting of N.C.T.M. in Wichita, 1949; for ten years a director of Wichita City Tchrs. Cr. Union.

LYONS, CATHERINE A. V., Perry High School, Pittsburgh, Pa. B.A., U. of Pittsburgh, M.S., Ph.D.; attended summer sessions at universities in other parts of the country. All teaching experience in Pittsburgh: mathematics from 3rd gr. through 12th gr., four summers in Dem. Sch., formerly at U. of Pittsburgh, four years in Vet. Tr. Program, at present senior math. at

Perry H.S. Member: N.C.T.M. 1930–; former officer of Western Pa. Assoc. of Math. Tchrs. and State Round Table; chairman of organization of Pa. Council of Tchrs. of Math., 1950–; co-chairman of local com., 29th Ann. Meeting,

CATHERINE A. V. LYONS

N.C.T.M. in Pittsburgh, 1951; officer of Doctoral Assoc. of U. of Pittsburgh; officer of A.A.U.W.; Pi Lambda Theta; Business and Prof. Women; has appeared on N.C.T.M. programs. Only publications are short articles in local bulletins.

ROURKE, ROBERT E. K., Pickering College, Newmarket, Ontario. Graduated with honors,

ROBERT E. K. ROURKE

gold medal in math., and research scholarship, Queen's U., Kingston, Ont.; M.A. Harvard U.; also completed courses for the doctorate; twice appointed Shattuck Scholar. Joined staff of Pickering Coll. Jan. 1928, asst. headmaster, 1940, assoc. headmaster, 1942, headmaster, 1947. Member: N.C.T.M. 1935–, presently Ontario delegate and member of Yearbook Com.; past pres. Ontario Assoc. of Tchrs. of Math. and Physics; member of executive of Canadian Math. Congress. Co-author of: "An Advanced Course in Algebra"; "Plane Trigonometry and Statics"; "Mathematics for Canadians," Books I, II, and III; "Why Study Mathematics"; articles and papers on teaching of high school mathematics. Hobbies: Gilbert and Sullivan (has directed and acted in G. and S. for 18 yrs.); philately (stamps of early Canada); camping (dir. of Camp Mazinaw for boys).

VAN ENGEN, H., Iowa State Teachers College, Cedar Falls, Ia. B.A. Nebraska Wesleyan U.; Ph.D., U. of Michigan. Tchr. of math., Jr. and Sr. H.S., Holdrege, Neb., 1927–29 and 1930–31; Tappan Jr. H.S., Ann Arbor, Mich., 1934–35; instr. School of Educ., West-

H. VAN ENGEN

ern Reserve U., 1935; asst. prof. of math., Kansas St. Coll., 1936; head, dept. of math., Iowa St. Tchrs. Coll., 1937–. Member: N.C.T.M., C.A.S.M.T., Math. Assn. of Am., Am. Math. Soc., I.S.E.A., A.A.U.P., Ia. Assoc. of Math. Tchrs. (Member of Board of Dir.), P.B.K., P.K.P., Sigma Xi. Author: "Analysis of Meaning in Arithmetic," Elem. Sch. Jr., Feb.–Mar., 1949; "Place Value and the Number System," Arith. 1947; "Arithmetic; Teaching Fractions," Ed. Service Pub. V.1, No. 3, Iowa St. Tchrs. Coll.; "An Aspect of Meaning in Arithmetic," Elem. Sch. Jr., Jan. 1946; "Developing an Understanding of Place Value in Second and Third Grade," S.S.M., May 1945; "Triads and Tables," N.E.A. Jr., Feb., 1946; "Developing the Fraction Concept," Neb. Educ. Jr., Dec. 1946–Jan. 1947; "Handbook for Arithmetic," Mid. Sch. Jr., Sept. 1944; "Logical Approaches to $(-a)(-b)$," Math. Tchr., Apr. 1947; "Unifying Ideas in Arithmetic," Elem. Sch. Jr., Dec. 1941; "Function of a Mathematics Department in a Teachers Institution." Sch. and Soc., Dec. 1938.

WAYNE, ALAN, Williamsburgh Vocational High School, New York, N. Y. B.S., Coll. of City of New York, M.S. in Ed.; grad. work at Tchrs. Coll., Columbia U., New York U., and in pure math. at Columbia U., 1939–49.

Instructor in math. and sc., Rhodes, School (private H.S.) 1930–40; tchr. of math., Jr. H.S. 120, Manhattan, N.Y.C., 1940–45; tchr.

ALAN WAYNE

of math., Brooklyn H.S. of Automotive Trades Annex, N.Y.C., 1945–48, chmn. of related and tech. subjects, 1948–50; chmn. of related and tech. subjects and chmn. of program and organization, 1950–; part-time inst. in ed. at N.Y.U., 1950–51; part-time inst. in math., Cooper Union Sch. of Eng., N.Y.C., 1949–51; co-ordinator and tchr. of in-service courses, N.Y.C. Bd. of Ed., 1950. Member: N.C.T.M., 1940–; C.A.S.M.T., 1939–; Math. Assn. of Am., 1941–; Nat. Assn. of Biol. Tchrs., 1942–50; Am. Math. Soc., 1941–; Assoc. of Tchrs. of Math., 1933–; pres. 1948–50, Mem. Ex. Bd. 1943–51, V. P. for Jr. H.S. 1945, editorial board of Bulletin, 1948–49; Assoc. for Sup. and Cur. Dev. 1949–; New York Cipher Soc., 1941–, charter member; Am. Voc. Assoc.; N.Y. St. Voc. and Pract. Arts Assoc., 1950–; N.Y. Riddlers Club, pres. 1939; member and subcommittee chmn. of N.Y.C. Supt. of Schools Com. to study the teaching loads in high schools, 1950; member of standing com. on math. of the H.S. division, N.Y.C., 1949–51. Co-author of laboratory manual "Directed Experiments in Biology" with Robbins; co-constructor (with 4 others) of N.Y. Arith. Comp. Test and the N.Y. Arith. Judgments Test. Articles in S.S.M. 1945; Am. Biol. Tchr. 1947; Bull. of Assoc. of Tchrs. of Math. of N.Y.C., 1945, 1946; Am. Math. Monthly, 1944, 1949; Scripta Mathematica, 1946.

Revision of By-Laws

(*Continued from page 110*)

the annual meeting of the Council and shall serve as a forum which may make recommendations to the Board of Directors concerning activities and policies of the Council.

ARTICLE VI

AMENDMENTS

1. Amendments to these By-Laws may be made at any annual business meeting of the Council or special meeting called for that purpose, providing that due notice concerning such amendments shall have been printed in the official journal or mailed to each member at least one month before the date of such meeting.

2. No changes in the Certificate of Organization or the By-Laws shall have legal effect until a certificate thereof, verified by oath of the President and under the Seal of the Council, attested by the agent of the Council, shall be filed in the office of the Secretary of State of the State of Illinois and recorded in the office of the Recorder of Deeds for McDonough County, Illinois.

Knox College Science Prize Competition, 1951-52

Two mathematics scholarships, one for $1000 and one for $450, will be awarded this spring in a contest to be held at Knox College at Galesburg, Illinois on Saturday, March 10, 1951 at 10 A.M. The examination in mathematics is primarily designed to measure ability and understanding in mathematics and presupposes a knowledge of algebra and plane geometry. Each high school may enter three contestants and only those students are eligible who rank in the highest quarter of their high school class and are recommended by a high school science teacher. Applications should be forwarded by the recommending teacher so as to reach the Committee on Scholarships, Knox College, Galesburg, Illinois not later than March 3, 1951.

NOTES ON AFFILIATED GROUPS

JOHN R. MAYOR
Chairman, Committee on Affiliated Groups

DELEGATE ASSEMBLY

SUGGESTIONS received from representatives of Affiliated Groups continue to emphasize the need for and desirability of increased co-ordination of the activities of the Affiliated Groups and the National Council. The Group representatives and other interested Council members continue to send in excellent suggestions for new services that the National Council might render the Affiliated Groups and individual Council members. The suggestions also have given consideration to the possibilities for the Affiliated Groups to help the National Council in rendering these services. For example, the Affiliated Groups could carry a major part of the responsibility in studies of certificate requirements in the various states, preparation of a bibliography of state and local courses of study, in the organization of plans for exchange of mathematics teachers within the country.

It has been pointed out that Affiliated Groups are prepared to appoint, or already have appointed, Co-ordinating Committees as proposed by the First Delegate Assembly, but that the functions of these Committees are not clear to the Affiliated Groups. This is a question of real importance for the Second Delegate Assembly. The delegates of the Groups can be instrumental in determining an organization which might supervise and correlate the work of these Committees. Some have expressed an interest in reconsideration of a few of the recommendations of the First Delegate Assembly.

Some unfavorable reaction has resulted from the question raised about the possibility of Affiliated Groups assuming, by a plan of rotation, editorship of the Newsletter of Affiliated Groups. Those making this suggestion in the first place did so only with the idea that the expense of publication under such a plan would be paid by the National Council from the annual renewal of affiliation dues. Affiliated Groups can be sure that the Committee on Affiliated Groups is strongly opposed to any suggestions which would increase the cost of affiliation for the various Groups.

A report of suggestions from Affiliated Groups will be published again in this section in the March issue of *The Mathematics Teacher*. While there will be little time then before the Delegate Assembly for your Group and your delegate to consider these suggestions, it is, nevertheless, important to give whatever opportunity is possible for widespread consideration of proposals of the various Groups.

Be sure that your Group is prepared to take advantage of the Second Delegate Assembly as a means of expressing your opinion on obligations and advantages of Affiliation and to make suggestions for the general welfare of the National Council and for the improvement of mathematics teaching everywhere!

ADVANTAGES OF AFFILIATION

In answer to rather frequent requests from groups, considering affiliation, for a statement of advantages of affiliation, the following list was prepared. Statements from readers which might be added to this list will be greatly appreciated and will be published in this section. What has affiliation meant to your Group? What advantages of affiliation do you think should be emphasized for those considering application for affiliation?

Some of the advantages which may come to your organization of teachers of mathematics from affiliation with the National Council of Teachers of Mathematics are:

1. Affiliation is a declaration of your support of the only national organization devoted to the improvement of the teaching of mathematics at all levels of instruction, and your affiliation strengthens this national organization.
2. Affiliation provides your group direct association not only with the national organization of mathematics teachers but also with other state and regional organizations with purposes and programs like your own.
3. Affiliation gives to you an opportunity to take part in discussions of the problems and activities of the National Council, especially in relation to Affiliated Groups, through the Delegate Assembly.
4. The National Council has a Committee on Affiliated Groups which works with designated officers in your group, if affiliated, to co-ordinate your program with that of other state and regional groups and with the National Council. This Committee can be of assistance in calling to your attention activities of the National Council which should be of especial interest and value to your group. The Committee will help you work out a plan of co-operation with other groups in your area for research and study of common problems and for regional meetings.
5. Affiliated Groups maintain an exchange list of publications so that the editor of your journal may receive copies of publications of other Affiliated Groups.
6. Materials prepared by Committees of the Council may more readily reach your members through the affiliated relationship.
7. There is a Newsletter of Affiliated Groups in which are reports of activities of other Groups similar to your own, announcements of activities of the National Council of special interest to state and regional groups, and statements of the program of the Committee on Affiliated Groups.
8. The Committee on Affiliated Groups is planning the organization of a Speakers Bureau to serve the member Groups.
9. Affiliated Groups have been influential in bringing meetings of the National Council to their part of the country and they are essential to the National Council in carrying out regional planning and arrangements.
10. An effective national professional organization must be able to reach all areas of the country and to reach individual mathematics teachers everywhere. The Affiliated Groups can serve their own best interests by making sure that the National Council is effective in this sense.

New Groups

At October and early November meetings four regional and state mathematics organizations voted to make application for affiliation with the National Council. These groups and the officers who sent requests for the application form are:

Arkansas Council of Mathematics Teachers: Mary Lee Foster, Henderson State Teachers College, Arkadelphia

Oklahoma City Mathematics Council: Virginia C. Shike, Jackson Junior High School, Oklahoma City

Mathematics Section, South Dakota Education Association: Florence Krieger, Rapid City High School, Rapid City

Teachers of Mathematics of the Western Division of the Tennessee Education Association: Rush W. Siler, East High School, Memphis, Tennessee

Kenneth R. Allred of Salt Lake City has written an enthusiastic letter about the progress of the Utah state organization of mathematics teachers and has asked for affiliation application blanks. It is anticipated that by the time of the publication of this report, all of these groups will have officially completed their affiliation and will have made plans to send delegates to the Second Delegate Assembly. Teachers in these areas who are not members of these groups may wish to communicate with the officers listed above about membership in and activities of these important regional groups.

Ona Kraft of Collinwood High School, Cleveland, has reported the organization early in November of the Ohio Council of Teachers of Mathematics. H. E. Grime of Cleveland has been elected president and plans are already underway for a meeting April 21, 1951, in Columbus.

Philip Jones of the University of Michigan has sent to the Committee on Affiliated Groups a very comprehensive report of a meeting of Michigan teachers in May.

Ontario Journal

H. E. Totton, Forest Hill Collegiate Institute, Toronto, has sent to the Committee on Affiliated Groups a copy of the fall issue of the Newsletter of The Ontario Association of Teachers of Mathematics and Physics. Mr. Totton is Publicity Representative of this Affiliated Group.

(Continued on page 127)

Program

The National Council of Teachers of Mathematics

Twenty-Ninth Annual Meeting

Hotel William Penn, Pittsburgh, Pa.
March 28, 29, 30, 31, 1951

WEDNESDAY, MARCH 28, 1951

9:00 A.M.–12:00 NOON. Meeting of the Board of Directors—Parlor G

2:00 P.M.–5:00 P.M. Meeting of the Board of Directors—Parlor G

4:00 P.M.–9:00 P.M. Registration—Corridor of 17th Floor

7:30 P.M.–10:30 P.M. Meeting of the Board of Directors—Parlor G

MORNING AND AFTERNOON. *Visiting Pittsburgh Schools.* (See announcement at end of program.)

THURSDAY, MARCH 29, 1951

8:00 A.M.–9:00 P.M. Registration—Corridor of 17th Floor

MORNING. *Visiting Pittsburgh Schools.* (See announcement at end of program.)

8:00 A.M.–10:00 A.M. Delegate Assembly (First Session)—Ft. Pitt Room
Meeting of the official delegates of the affiliated groups. (The second session is on Friday afternoon.)

9:00 A.M.–5:00 P.M. Exhibits, commercial and instructional—Urban Room

10:00 A.M.–11:00 A.M. Meeting of state representatives with the Board of Directors—Ft. Pitt Room
Presiding: KENNETH E. BROWN, University of Tennessee, Knoxville, Tennessee

10:00 A.M.–12:00 NOON. Mathematics Laboratory—Allegheny Room
Teaching Aids for Algebra,—Models, Curve Stitching, Paper Folding. FRANCES C. JOHNSON, Senior High School, Oneonta, New York

10:00 A.M.–1:00 P.M. Sightseeing Trip (See announcement at end of program.)

2:00 P.M.–3:15 P.M. *General Section*—Ft. Duquesne Room
Presiding: MARY A. POTTER, Racine Public Schools, Racine, Wisconsin
The Teacher as an Artist, W. W. RANKIN, Duke University, Durham, North Carolina

2:00 P.M.–3:15 P.M. *General Section*—Ft. Pitt Room
Presiding: HOUSTON T. KARNES, Louisiana State University, Baton Rouge, Louisiana
Number and Its Development on the Teacher Training Level, AARON BAKST New York University, New York City

2:00 P.M.–3:15 P.M. *Secondary Section*—Ball Room
Presiding: ONA KRAFT, Collinwood High School, Cleveland, Ohio
Targets for Teachers of High School Mathematics, ROBERT E. K. ROURKE, Pickering College, Newmarket, Ontario

2:00–3:15 P.M. *Teacher Education Section*—Monongahela Room
Presiding: WILLIAM A. GAGER, University of Florida, Gainesville, Florida
Topic: *Professional Laboratory Experiences in a Mathematics Methods Course*
Bases for Participation in Mathematics Classes, HAROLD FAWCETT, Ohio State University, Columbus, Ohio
Participation in the Public Schools, CLARENCE ETHEL HARDGROVE, Northern Illinois State Teachers College, De Kalb, Illinois
Participation in a Mathematics Clinic, NATHAN LAZAR, Ohio State University, Columbus, Ohio

2:00 P.M.–4:00 P.M. Mathematics Laboratory—Allegheny Room
Teaching Aids for Geometry,—Plastic Models, Demonstration Boards, AMELIA RICHARDSON, McKeesport High School, McKeesport, Pa.

3:30 P.M.–4:30 P.M. Business Meeting of NCTM (First Session)—Monongahela Room
Presiding: H. W. CHARLESWORTH, East High School, Denver, Colorado (The second business session is on Saturday morning.)

7:30 P.M.–9:00 P.M. General Session of the Convention—Ball Room. (Everyone is urged to attend.)

Speaker: RAY C. MAUL, Research Associate, National Commission on Teacher Education and Professional Standards, National Education Association of the United States, Washington, D. C.

Address: *Some Critical Problems in Teacher Education*

9:15 P.M.–10:30 P.M. Reception—Monongahela Room

FRIDAY, MARCH 30, 1951

8:00 A.M.–9:00 P.M. Registration—Corridor of 17th Floor

9:00 A.M.–5:00 P.M. Exhibits—Urban Room

9:00 A.M.–11:00 A.M. Mathematics Laboratory—Allegheny Room

The Construction and Effective Use of Individual Models for Pupils, FRANCES M. BURNS, Oneida High School, Oneida, New York

9:00 A.M.–10:00 A.M. *Continuity Section Meetings.* Everyone is urged to attend one of these four sections. (See announcement at end of program.)

Elementary Continuity Section—Ft. Pitt Room

Presiding: DALE CARPENTER, Los Angeles City Schools, Los Angeles, California

Topic: *Language as Aid or Deterrent to the Development of Meaning, PART I*

Speaker-Analyst: R. L. MORTON, Ohio University, Athens, Ohio

Junior High School Continuity Section—Monongahela Room

Presiding: AGNES HERBERT, Clifton Park Junior High School, Baltimore, Maryland

Topic: *How Can We Teach Problem Solving?, PART I*

Speaker-Analyst: HOWARD F. FEHR, Teachers College, Columbia University, New York City

Senior High School Continuity Section—Ball Room

Presiding: DONOVAN A. JOHNSON, University of Minnesota High School, Minneapolis, Minnesota

Topic: *What Improvements in the Mathematics Programs of Senior High Schools Are Most Urgently Needed? PART I*

Speaker-Analyst: M. L. HARTUNG, University of Chicago, Chicago, Illinois

College Continuity Section—Ft. Duquesne Room

Presiding: JAMES H. ZANT, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma

Topic: *Good Teaching: Organization, Methods, Learning, PART I*

Speaker-Analyst: COL. ROBERT C. YATES, United States Military Academy, West Point, New York

10:00 A.M.–12:00 NOON. *Continuity Discussion Groups.* Registration in one of these groups will indicate your desire to participate in the continuity portion of the program and your intention to attend both the Friday morning and Saturday morning Continuity Sections which correspond to the discussion group chosen. See announcement at end of program.

Elem. Group—Parlor B

Topic: *Language as an Aid or Deterrent to the Development of Meaning*

Leader: LENORE JOHN, The Laboratory School, University of Chicago, Chicago, Illinois

JHS Group A—Parlor C

Topic: *What Psychological Aspects Are Involved in Learning Problem Solving?*

Leader: GERTRUDE HENDRIX, Eastern Illinois State College, Charleston, Illinois

JHS Group B—Parlor D

Topic: *What Are the Specific Problem Solving Objectives in the Junior High School?*

Leader: JOY E. MAHACHEK, Indiana State Teachers College, Indiana, Pennsylvania

SHS Group A—Parlor E

Topic: *What Improvements in the Algebraic Aspects of the Programs of the Senior High Schools Are Most Urgently Needed?*

Leader: F. G. LANKFORD, JR., University of Virginia, Charlottesville, Virginia

SHS Group B—Parlor F

Topic: *What Improvements in the Geometric Aspects of the Programs of the Senior High Schools Are Most Urgently Needed?*

Leader: HAROLD FAWCETT, Ohio State University, Columbus, Ohio

Coll. Group—Parlor G

Topic: *Good Teaching: Organization, Methods, Learning*

Leader: PHILLIP S. JONES, University of Michigan, Ann Arbor, Michigan

10:15 A.M.–11:45 A.M. *Elementary Section*—Ft. Pitt Room
Presiding: ELLA MARTH, Harris Teachers College, St. Louis, Missouri
What Is Meaningful Arithmetic? ROBERT H. KOENKER, Ball State Teachers College, Muncie, Indiana
Introducing Arithmetic Meanings to Drill-Trained Pupils, ROBERT L. BURCH, School of Education, Boston University, Boston, Massachusetts

10:15 A.M.–11:45 A.M. *Algebra Section*—Pittsburgh Room
Presiding: ROBERT E. K. ROURKE, Pickering College, Newmarket, Ontario
Teaching the Important Concepts in Algebra, KENNETH E. BROWN, University of Tennessee, Knoxville, Tennessee
The Generalized Solution, a Major Objective of Algebra, H. C. CHRISTOFFERSON, Miami University, Oxford, Ohio

10:15 A.M.–11:45 A.M. *Computation Section*—Ft Duquesne Room
Presiding: WALTER H. CARNAHAN, Purdue University, Lafayette, Indiana
Basic Electric Computing Devices, SAMUEL A. SCHARFF, Engineer, The M. W. Kellogg Company, Jersey City, New Jersey
A 100% Method for Locating the Decimal Point in Slide Rule, Machine, and All Other Types of Computation, CARL N. SHUSTER, State Teachers College, Trenton, New Jersey

10:15 A.M.–11:45 A.M. *College Section*—Monongahela Room
Presiding: CHARLES H. BUTLER, Western Michigan College of Education, Kalamazoo, Michigan
The Need of Dual Mathematics Curricula in Junior Colleges, WILLIAM A. GAGER, University of Florida, Gainesville, Florida
The Topical Content for a Course in General Mathematics at the College Level—Student Opinion, HERBERT HANNON, Western Michigan College of Education, Kalamazoo, Michigan

10:15 A.M.–11:45 A.M. *Teacher Education Section*—Rear of Ball Room
Presiding: CARROLL V. NEWSOM, The State Education Department, Albany, New York
Some Needs in the Field of Teacher Education at the Undergraduate Level With Reference to the Teaching of Mathematics, J. H. ZANT, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma
Graduate Training for High School Teachers, HOUSTON T. KARNES, Louisiana State University, Baton Rouge, Louisiana

10:15 A.M.–12:00 NOON. Affiliated Groups—Panel Discussion—Ball Room
Topic: *What Are City, County, and State Mathematics Groups Doing?*
Leader: J. R. MAYOR, University of Wisconsin, Madison, Wisconsin
Participants: Presidents of Affiliated Groups
Greater Cleveland Mathematics Club, SAMUEL GOLDSTEIN, Cleveland
Association of Mathematics Teachers of New Jersey, MARY C. ROGERS, Westfield, New Jersey
Nassau County Mathematics Teachers Association, KARL F. BILLHARDT, Great Neck, New York
Association of Teachers of Mathematics of New York City, HARRY D. RUDERMAN, New York City
West Virginia Council of Mathematics Teachers, JULIA E. ADKINS, Ceredo, West Virginia
Mathematics Section of Maryland State Teachers Association, MARGARET L. HEINZERLING, Baltimore, Maryland
Western Pennsylvania Mathematics Teachers Association, CLEMENTINA GEORGE, Braddock, Pennsylvania
Richmond, Virginia, Section of the NCTM, MARY HAWKINS, Richmond, Virginia

1:15 P.M.–2:15 P.M. *General Sectional Meeting*—Ball Room
Presiding: CARL N. SHUSTER, State Teachers College, Trenton, New Jersey
The Mathematics Teacher in Transition, DANIEL W. SNADER, University of Illinois, Urbana, Illinois

1:15 P.M.–2:15 P.M. *General Sectional Meeting*—Ft. Duquesne Room
Presiding: M. H. AHRENDT, Anderson College, Anderson, Indiana
What Is Vocational Mathematics? ALAN WAYNE, Brooklyn Auto Trades High School, Brooklyn, New York

1:15 P.M.–2:15 P.M. *General Sectional Meeting*—Ft. Pitt Room
Presiding: HENRY VAN ENGEN, Iowa State Teachers College, Cedar Falls, Iowa

What Are the Implications of Research for the Teaching of Mathematics? (Discussion) JOHN J. KINSELLA, School of Education, New York University, New York

1:15 P.M.–2:15 P.M. *Class Teaching Demonstration*—Monongahela Room
This demonstration will be conducted with children of ages five to ten.
Teacher: CATHERINE STERN, The Castle School, New York City.

1:15 P.M.–2:15 P.M. *Delegate Assembly (Second Session)*—Allegheny Room
Meeting of the official delegates of the affiliated groups.

2:45 P.M.–4:15 P.M. *Elementary Section*—Ft. Pitt Room
Presiding: IDA MAE HEARD, Southwestern Louisiana Institute, Lafayette, Louisiana
An Introduction to Structural Arithmetic, CATHERINE STERN, The Castle School, New York City
Answering Some "Whys" in Arithmetic, F. LYNWOOD WREN, George Peabody College for Teachers, Nashville, Tennessee

2:45 P.M.–4:15 P.M. *Secondary Section*—Ball Room
Presiding: MARTHA HILDEBRANDT, Proviso Township High School, Maywood, Illinois
Junior High School Mathematics in the New Education, MARY C. ROGERS, Roosevelt Junior High School, Westfield, New Jersey
Useful Topics in Which Slow Learners Can Succeed, ANNE L. NEITZEL, Washington Park High School, Racine, Wisconsin

2:45 P.M.–4:15 P.M. *Senior High School Section*—Monongahela Room
Presiding: E. H. C. HILDEBRANDT, Northwestern University, Evanston, Illinois
Team Work in Mathematics and Science, ROBERT H. CARLETON, Executive Secretary, National Science Teachers Association, NEA, Washington, D. C.
Developing Mathematics from Physics and Chemistry Demonstrations, HENRY W. SYER, School of Education, Boston University, Boston, Massachusetts. Assisted by PAUL G. BUCKLEY, Durfee High School, Fall River, Massachusetts

2:45 P.M.–4:15 P.M. *College and High School Section*—Ft. Duquesne Room
Presiding: GILBERT ULMER, University of Kansas, Lawrence, Kansas
The Role of Arithmetic in an Introductory Course in College Mathematics, C. V. NEWSOM, Associate Commissioner for Higher Education, The State Education Department, Albany, New York
The Training of Superior Students, W. B. MAC LEAN, University of Toronto Schools, Toronto, Ontario

2:45 P.M.–4:15 P.M. *Guidance Section*—Allegheny Room
Presiding: MARIE S. WILCOX, Washington High School, Indianapolis, Indiana
Guidance in Mathematics from the Junior High School Point of View. HUMPHREY C. JACKSON, John D. Pierce Junior High School, Grosse Pointe, Michigan
How Guidance is Carried Out in a Typical Mid-Western High School. HENRY A. MEYER, Central High School, Evansville, Indiana

2:45 P.M.–4:15 P.M. *Discussion Groups* (Reservations should be made in advance. See announcement at end of program.)
Group A1—Parlor B
Topic: *How Can We Challenge the Exceptional Pupils?*
Leader: GEORGE E. HAWKINS, Lyons Township High School and Junior College, LaGrange, Illinois
Group A2—Parlor C
Topic: *Some Unusual Techniques in the Teaching of Algebra*
Leader: ROBERT V. BELDING, Thomas Carr Howe High School, Indianapolis, Indiana
Group A3—Parlor D
Topic: *Outdoor Work in Mathematics*
Leader: W. S. RUMBOUGH, Principal, Falls Church High School, Falls Church, Virginia
Group A4—Parlor E
Topic: *Inexpensive Teaching Aids for Secondary School Mathematics*
Leader: RUSSELL L. SCHNEIDER, Eastern High School, Lansing, Michigan
Group A5—Parlor F
Topic: *Addition and Subtraction of Positive and Negative Numbers*
Leader: WALTER BERNARD, Providence Classical High School, Providence, Rhode Island
Group A6—Parlor G
Topic: *A Fifth Year Program for the Training of Mathematics Teachers*

Leader: ORVAL L. PHILLIPS, East Carolina Teachers College, Greenville, North Carolina

4:15 P.M.–5:15 P.M. Films—Allegheny Room

6:30 P.M. (Friday) Annual Banquet—Pittsburgh Room

Speaker: DWAYNE ORTON, Director of Education, International Business Machines Corporation, New York City

Address: *The Teacher's Faith*

SATURDAY, MARCH 31, 1951

8:00 A.M.–12:00 NOON. Registration—Corridor of 17th Floor

8:00 A.M.–12:00 NOON. Exhibits—Urban Room

8:00 A.M.–9:15 A.M. Films—Allegheny Room

8:30 A.M.–9:15 A.M *Continuity Section Meetings*

(Everyone is urged to attend one of these four sections. See announcement at end of program.)

Elementary Continuity Section—Ft. Pitt Room

Presiding: DALE CARPENTER, Los Angeles City Schools, Los Angeles, Calif.

Topic: *Language as an Aid or Deterrent to the Development of Meaning, PART II*

Speaker-Analyst: R. L. MORTON, Ohio University, Athens, Ohio

Junior High School Continuity Section—Monongahela Room

Presiding: AGNES HERBERT, Clifton Park Junior High School, Baltimore, Maryland

Topic: *How Can We Teach Problem Solving? PART II*

Speaker-Analyst: HOWARD F. FEHR, Teachers College, Columbia University, New York City

Senior High School Continuity Section—Ball Room

Presiding: DONOVAN A. JOHNSON, University of Minnesota High School, Minneapolis, Minnesota

Topic: *What Improvements in the Mathematics Programs of Senior High Schools Are Most Urgently Needed? PART II*

Speaker-Analyst: M. L. HARTUNG, University of Chicago, Chicago, Illinois.

College Continuity Section—Ft. Duquesne Room

Presiding: JAMES H. ZANT, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma

Topic: *Good Teaching: Organization, Methods, Learning, PART II*

Speaker-Analyst: ROBERT C. YATES, United States Military Academy, West Point, New York

9:30 A.M.–11:00 A.M. *Elementary Section*—Ft. Pitt Room

Presiding: F. LYNWOOD WREN, George Peabody College for Teachers, Nashville, Tennessee

A Summary of the Research and Recommendations in the Preparation of Teachers of Arithmetic, ELLA MARTH, Harris Teachers College, St. Louis, Missouri

Teaching Mathematical Meanings of Multiplication, LUCY L. ROSENQUIST, Colorado State College of Education, Greeley, Colorado

9:30 A.M.–11:00 A.M. *Secondary Section*—Ball Room

Presiding: JOHN J. KINSELLA, New York University, New York City

Essentials of a Mathematics Program for All High School Students, DALE CARPENTER, Supervisor, Mathematics Education Section, Los Angeles City Schools, Los Angeles, California

The Mathematical Needs of Students Who Anticipate Entering a College of Engineering, K. B. HENDERSON, University of Illinois, Urbana, Illinois

9:30 A.M.–11:00 A.M. *Gifted Students Section*—Allegheny Room

Presiding: VIRGIL S. MALLORY, State Teachers College, Montclair, New Jersey

Mathematics Program for the Able, G. BALEY PRICE, The University of Kansas, Lawrence, Kansas

What Mathematics Shall We Teach in the Fourth Year of High School? C. C. MACDUFFEE, University of Wisconsin, Madison, Wisconsin

Discussants: GEORGE E. HAWKINS, Lyons Township High School and Junior College, La Grange, Illinois, and W. B. MACLEAN, University of Toronto Schools, Toronto, Ontario

9:30 A.M.–11:00 A.M. *Multi-Sensory Aids Section*—Monongahela Room

Presiding: MARY C. ROGERS, Roosevelt Junior High School, Westfield, New Jersey

Multi-Sensory Aids, MADELINE MESSNER, Abraham Clark High School, Roselle, New Jersey

Mechanical Instructional Aids, GEORGE R. ANDERSON, State Teachers College, Millersville, Pennsylvania

9:30 A.M.–11:00 A.M. *College Section*—Ft. Duquesne Room
Presiding: JAMES S. TAYLOR, University of Pittsburgh, Pittsburgh, Pa.
Relativity and the Atom, ALFRED SCHILD, Carnegie Institute of Technology, Pittsburgh, Pa.
What Should Constitute a College Curriculum in Mathematics?, MORRIS OSTROFSKY, Duquesne University, Pittsburgh, Pennsylvania

9:30 A.M.–11:00 A.M. *Discussion Groups.* (Reservations should be made in advance. See announcement at end of program.)
Group B1—Parlor B
Topic: *Which Students in High School Should Study Algebra and Geometry?*
Leader: GILBERT ULMER, University of Kansas, Lawrence, Kansas
Group B2—Parlor C
Topic: *Achievement Tests in Algebra and Geometry*
Leader: CHARLES L. TUBBS, Washington Park High School, Racine, Wisconsin
Group B3—Parlor D
Topic: *What Teaching Devices Can Be Used to Arouse Interest of Students for Algebra and Geometry?*
Leader: MARTHA HILDEBRANDT, Proviso Township High School, Maywood, Illinois
Group B4—Parlor E
Topic: *Mathematics Institutes, Workshops, and Conferences*
Leader: MARY A. POTTER, Racine Public Schools, Racine, Wisconsin
Group B5—Parlor F
Topic: *Problems Concerning the Place of Mathematics in General Education in the Junior College*
Leader: J. HOUSTON BANKS, George Peabody College for Teachers, Nashville, Tennessee
Group B6—Parlor G
Topic: *Evaluating the Outcomes of Instruction. (Grades 5 through 8)*
Leader: OLIVE G. WEAR, Fort Wayne Public School, Fort Wayne, Indiana

11:00 A.M.–12:00 NOON. Second Business Session of NCTM—Monongahela Room

12:30 P.M. (Saturday) Convention Luncheon—Ball Room
(Reservations should be made in advance. See announcement at end of program.)

2:30 P.M.–4:00 P.M. Films and Forum—Allegheny Room

2:30 P.M.–4:00 P.M. *Elementary Section.* (Panel)—Ft. Pitt Room
Topic: *Meanings in Arithmetic*
Chairman: W. B. STORM, Northern Illinois State Teachers College, De Kalb, Illinois
Other Members of Panel: VINCENT J. GLENNON, Syracuse University, Syracuse, New York; ESTHER F. JENSSEN, Norman Bridge School, Chicago, Illinois; J. T. JOHNSON, Northwestern University, Evanston, Illinois; HELEN SCHNEIDER, Oak School, La Grange, Illinois; H. VAN ENGEN, State Teachers College, Cedar Falls, Iowa

2:30 P.M.–4:00 P.M. *Secondary Section.* (Panel)—Ball Room
Topic: *How Can Mathematical Competence Be Assured for All High School Graduates?*
Chairman: VERYL SCHULT, Public Schools, Washington, D. C.
Other Members of Panel: ALLENE ARCHER, Thomas Jefferson High School, Richmond, Virginia; IDA MAE BERNHARD, State Teachers College, San Marcos, Texas; FRANCES M. BURNS, Oneida High School, Oneida, New York; JOHN MAYOR, University of Wisconsin, Madison, Wisconsin; PHILIP PEAK, University High School Bloomington, Indiana; MARIE S. WILCOX, Washington High School, Indianapolis, Indiana

2:30 P.M.–4:00 P.M. *Geometry Section*—Ft. Duquesne Room
Presiding: EDWIN W. SCHREIBER, Western Illinois State College, Macomb, Illinois
Geometry and Clear Thinking, H. BOWERS, Principal, Stratford Normal School, Stratford, Ontario
Teaching of Locus, VIRGIL S. MALLORY, State Teachers College, Montclair, New Jersey

2:30 P.M.–4:00 P.M. *Teacher Education Section*—Monongahela Room
Presiding: HENRY W. SYER, School of Education, Boston University, Boston, Massachusetts
A New Responsibility for Teacher Education Programs, LEE E. BOYER, State Teachers College, Millersville, Pennsylvania
Some Overlooked Bets in Teaching Mathematics, CHARLES H. BUTLER, Western Michigan College of Education, Kalamazoo, Michigan

ANNOUNCEMENTS

Registration

The registration fee is fifty cents for members of the National Council, members of the Mathematical Association of America, and for teachers in elementary schools. The fee for non-members and visitors is $1.50. Undergraduate students sponsored by a faculty member, relatives of members, invited speakers who are not members, members of the press, and commercial exhibitors are not charged a registration fee but should register. You may register in advance. Use the Advanced Registration and Reservation Form to be found on these pages.

Room Reservations at Hotel William Penn

Applications should be sent directly to Hotel William Penn, Pittsburgh 30, Pa. Rates are as follows:

Room with bath—one person—$4.50 to $9.00
Double with bath—two persons—$7.50 to $10.00
Twin beds with bath—two persons—$9.00 to $15.00
Additional cot in room—$3.00

Information

The Information Committee will furnish you with information on rooms, meals, parking, amusements, stores, schools, colleges, etc. A daily bulletin of special activities will be issued. When at the convention, ask for help at the Information Desk.

Banquet and Luncheon Reservations

Reservations for the banquet on Friday and the luncheon on Saturday may be made in advance. Requests should be accompanied with check or money order. All orders received before March 15 will be acknowledged by return mail. Banquet $4.00, luncheon $2.85, tax and tips included. Use the Advanced Registration and Reservation Form supplied herewith.

Continuity Sections and Discussions

In response to the demand for greater continuity in our programs, a small portion of this meeting will be devoted to what we are calling *"Continuity Sections and Discussions."* On Friday and Saturday mornings, four Continuity Sections, Elementary, Junior High School, Senior High School, and College, have been arranged. (Everyone is urged to attend one of these four Continuity Sections.)

Immediately following these Continuity Sections on Friday Morning, the Continuity Discussion Groups, (25 to a group, those who register for them) will meet for discussion of the problem presented by the speaker of the corresponding Continuity Section. On Saturday morning, these Continuity Discussion Groups (one from the Elementary Section, two from the Junior High School Section, two from the Senior High School Section, and one from the College Section) will make reports to their respective Continuity Section where the speaker of the Friday morning Continuity Section will act as analyst. He will evaluate the reports, relate them to the problem under consideration, and make further contributions to the problem. (Everyone is urged to attend one of these Continuity Sections on Saturday morning.)

If you wish to follow through with this phase of the convention program, you will register for the Continuity Discussion Group of your choice and attend the corresponding Continuity Section meeting on both Friday and Saturday morning. For example, if you register for one of the two Junior High School Continuity Discussion Groups, you will plan to attend the Junior High School Continuity Section on Friday morning and the one on Saturday morning. (Registration in the Continuity Discussion Groups will be on the basis of first come, first served. The advanced registration form is at the end of the program.)

This Continuity portion of the program is experimental. We shall ask for your evaluation of it. If your appraisal of it indicates that it should be continued, we can plan to extend it and improve upon it for future meetings.

Discussion Groups

Requests for attendance at these meetings, including the Continuity Discussion Groups, should be made in advance. First, second, and third choices should be made. Registration in one of the Continuity Discussion Groups will indicate your desire to participate in the continuity portion of the program and your intention of attending both the Friday morning and the Saturday morning Continuity Sections corresponding to the continuity discussion group chosen. Use the Advanced Registration and Reservation Form supplied here-

with. Admittance cards will be sent to those making requests before March 15. Admittance to these groups will be by admission card only.

Visiting Pittsburgh Schools

If you wish to visit the local schools on Wednesday (all day) or on Thursday morning, please send requests in advance to Dr. Dorothy Pickard, Beltzhoover School, Pittsburgh 10, Pa., or secure information at the Information Desk upon your arrival.

Mathematics Laboratory

This is a new feature on the program this year and is under the direction of Amelia Richardson, McKeesport High School, McKeesport, Pa. There will be three mathematics laboratory periods, each two hours in length. These will be on Thursday A.M. and P.M. and on Friday A.M. in the Allegheny Room. At the beginning of each period the Consultant in charge will give a thirty-minute talk and demonstration on the construction and use of models in the classroom. Then each member of the group will be given the opportunity of making one or two of these models. A minimum cost charge for materials used will be made. Refer to the program for further information. Use the Advanced Registration and Reservation Form supplied herewith.

Sightseeing Trip

Busses will leave Hotel William Penn at 10:00 A.M., Thursday, March 29, and return at 1:00 P.M. Points of interest will include the old Block House, a part of Fort Pitt, the Cathedral of Learning, the H. J. Heinz Plant, the Buhl Planetarium, the Golden Triangle of Pittsburgh, the city parks, and the steel mills. Stops will be made at all these points and an Incline Plane ride will be included. Price, $1.75. Make reservations for this trip before March 15. Use the Advanced Reservation Form supplied herewith.

Supplies and Equipment

Speakers and other participants in the program who need blackboards, projection equipment or other materials should communicate with Dr. Donald C. Steele, Baxter Junior High School, Pittsburgh 8, Pa., not later than March 15.

Commercial Exhibits

Textbooks and commercial teaching aids will be on exhibit in the Urban Room from Thursday morning at 9 o'clock to noon on Saturday. Inquiries for exhibit space should be addressed to L. McClure Lanning, University School, Howe Street, Pittsburgh, Pa.

School Exhibits

There will be an exhibit of mathematical models, instruments, teaching aids, and other classroom materials in the Urban Room from Thursday morning at 9 o'clock to Saturday noon. Inquiries should be addressed to Miss Helen Jenkins, McKeesport High School, McKeesport, Pa.

Meals for Special Groups

If any group wishes to arrange for a dinner on Thursday or a breakfast on Friday or Saturday, the local committee will help make these arrangements. Please write Dr. Catherine A. V. Lyons, 12 S. Fremont Avenue, Pittsburgh 2, Pa.

The Fawcett Ohio Staters will meet for luncheon at 12 o'clock, noon, on Friday, March 30. For reservations, write Mr. Oscar Schaaf, Department of Education, Ohio State University, Columbus 10, Ohio.

Location of Meeting Rooms

All rooms and parlors used for the meetings and discussions are on the 17th floor of Hotel William Penn, with the exception of the Pittsburgh Room which is in the basement of the hotel.

Mail and Telegrams

Mail and telegrams for those attending the convention should be addressed in care of The National Council of Teachers of Mathematics, Hotel William Penn, Pittsburgh 30, Pa. Mail may be obtained at the registration desk on the 17th floor.

Films and Filmstrips

These will be shown on Friday afternoon, Saturday morning and Saturday afternoon in the Allegheny Room.

Refunds on Reservations

No ticket refunds will be made later than three hours preceding the function for which reservations were made, i.e.,

sightseeing trip, the luncheon, and the banquet.

Certification of Attendance

If you care to take back to your school authorities a statement certifying your attendance at the convention, make request for it at the Registration Desk any time Saturday morning.

PROGRAM COMMITTEE

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LOCAL COMMITTEES

(NOTE: Members of committees are from the Pittsburgh public schools, unless otherwise indicated.)

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General Co-Chairmen—Catherine A. V. Lyons and Amelia Richardson (McKeesport)

Secretary—Clementina George (Braddock)

Treasurer—L. McClure Lanning (University School, Pittsburgh)

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A. W. Beattie, Superintendent, Allegheny County; Helen Calkins, Pennsylvania College for Women; E. A. Dimmick, Superintendent, Pittsburgh; James Lawson, Superintendent, McKeesport; Sister Michael, Mt. Mercy College; M. Ostrofsky, Duquesne University; Rev. Thomas Quigley, Superintendent, Parochial Schools; J. B. Rosenbach, Carnegie Institute of Technology; J. S. Taylor, University of Pittsburgh.

ADVANCED REGISTRATION AND RESERVATION FORM

Please fill out legibly and mail with remittance to Clementina George, 705 College Ave., Pittsburgh 32, Pa., before March 15, 1951. Checks or money orders should be made payable to L. McClure Lanning, Treasurer of the Pittsburgh meeting.

Name _____
Last First Initial

Home Address _____
Street and Number City Zone State

School Address _____
Name of School City State

Position _____

(Place an X before the address to which you wish your tickets sent.)

Registering as: Member of NCTM _____ Member of MAA _____ Elem. Teacher _____ Student _____ Exhibitor _____ Non-Member _____

Please check your field(s) of interest: Elem. _____ J.H.S. _____ S.H.S. _____ College _____ Teacher Education _____ Supervisor _____ Other _____

(Reverse side, please.)

Hospitality Committee

Co-Chairmen—Marjorie Harvey (Monessen) and Helen Williams, Lenora Allen, Maurice Arner, Agnes Bedell (McKeesport), Louise Di Prampero (Uniontown), Isabel Epley, Kathryn Hayes (Donora), Ella Koch, Grace Lemon (McKeesport), Mabel Milldollar (Harrison Township), Earl Whipkey (Mt. Lebanon), Kathryn Yurchich (Freeport).

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Chairman—Oscar Belles, Andrew Bradac, Joseph Feree (Bridgeville), Robert Graham, J. C. Stuchel.

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Chairman—Helen Malter (Coropolis), Gertrude Artzberger (West View), Elmo Callaway, Mildred Clyde (Stowe Township), H. E. Felich (Scott Township), Mary Elizabeth Hughes (McKeesport), Margaret Sampson (Washington), Louise Spinelli (Homestead), Cindy Staggers (S. Fayette Township), Jean Teats (University of Pittsburgh), Martha Ann Verner (McKeesport), Louise Ward (Sewickley).

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Banquet Committee

Chairman—Bertha Kirkpatrick, Julia

Registration Fee	$0.50 or $1.50	_____	Amount _____
Sightseeing Trip	Number @ $1.75	_____	Amount _____
Banquet	Number @ $4.00	_____	Amount _____
Luncheon	Number @ $2.85	_____	Amount _____
	Total Amount Enclosed		_____

Discussion Groups (Regular and Continuity)

First Choice: Group _____ Leader _____

Second Choice: Group _____ Leader _____

Third Choice: Group _____ Leader _____

Mathematics Laboratory (Indicate 1st and 2nd choices)

Thursday Morning _____ Thursday Afternoon _____ Friday Morning _____

Enrollments in the Discussion Groups and in the Mathematics Laboratory will be made as registrations come in and will be limited in number.

This advanced registration and reservation form should be used by one person only. If you need more forms, request these from the Secretary of the meeting, Clementina George, 705 College Avenue, Pittsburgh 32, Pa.

Brooke (Uniontown), W. C. Hulley, Jean McCrum (Aspinwall), L. E. Malvern (Carnegie Institute of Technology), George Phillips, Anne Rightmire (Mt. Lebanon), R. R. Sawhill (Carnegie), Ethel Turner, Floyd Wheelan, Edna Wintermute.

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Chairman—Dorothy Pickard, A. N. Addleman (Allegheny County), Sister Mary Louis (Parochial Schools).

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Co-Chairmen—L. McClure Lanning and W. J. Wagner.

School Exhibits Committee

Chairman—Helen Jenkins (McKeesport), George Anderson (Millersville), Lyda Hamilton (Latrobe), Oliver Henry, Florence Learzaf, Sarah Smith, I. J. Stright (Indiana State Teachers' College), Robert Trithart (Allison Park).

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Thursday Night Reception Committee

Chairman—L. McClure Lanning and chairmen of other local committees.

Affiliated Groups

(Continued from page 116)

The Ontario Newsletter is a lively publication which certainly is of much value to the members of the Ontario Association. In this particular issue were articles by J. A. Sonley, Ottawa, Past President of the Association; C. N. Shuster, Trenton, New Jersey, State Teachers College; and W. B. McLean, U.T.S., Toronto. In addition the journal carries a Question and Answer section with much useful information.

Membership Message

MARY C. ROGERS
Roosevelt Junior High School, Westfield, N. J.

WE ARE pleased to submit to you this third listing of Membership Honor Schools which we promised to you in our May 1950 membership message. We believe you will be proud of this report for it shows such a marked increase in Honor Schools over those listed in our first report just one year ago. Here are the figures.

	Dec. 1949	Dec. 1950	% of Change
100% Schools	26	41	58% increase
"All but One" Schools	14	12	14% decrease
Total Honor Schools	40	53	33% increase

Doubtless many more of you qualify for this recognition but were unable to submit your reports in the time limit given you. For you we have planned another listing in the May 1951 MATHEMATICS TEACHER. Present indications are that the May report will again announce a generous gain. Recent membership analyses by States show most commendable growth in many localities. It is quite probable that many schools in these States have all of their mathematics teachers members of National Council. May we hear from you to this effect not later than March 15, 1951. We shall be watching the mails for your letters. Simply complete the accompanying form and mail it to

Mary C. Rogers
462 North Avenue, East
Westfield, New Jersey

Please accept our sincere thanks for your interest and cooperation. Your enthusiastic support and generous assistance is greatly appreciated by the National Council. In return, we hope to give you increasingly effective service. We shall look forward to greeting a great many of you in person at the Annual Convention at Pittsburgh in March.

MEMBERSHIP REPORT TO THE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

School _____

School Address _____

Number of Teachers of Mathematics in Your School _____

Number of National Council Members _____

Report Submitted by _____

Your Address _____

National Council of Teachers of Mathematics

Membership Record

100% Schools—as of December 10, 1950

1. Ocala, Florida	Ocala High School
2. Ruskin, Florida	Ruskin School
3. Carterville, Illinois	Carterville Community High School
4. Freeport, Illinois	Freeport High School
5. Maywood, Illinois	Proviso Township High School
6. Normal, Illinois	Illinois State Normal University

7. Green City, Missouri	Green City High School
8. Valley Park, Missouri	Valley Park High School
9. Atlantic City, New Jersey	Brighton Avenue Elementary School
10. Caldwell, New Jersey	Mt. St. Dominic Academy
11. Convent Station, New Jersey	College of St. Elizabeth
12. Elizabeth, New Jersey	Battin High School
13. Englewood, New Jersey	Englewood School for Boys
14. Highland Park, New Jersey	Hamilton Junior High School
15. Highland Park, New Jersey	Senior High School
16. Jersey City, New Jersey	State Teachers College
17. Montclair, New Jersey	State Teachers College
18. Newark, New Jersey	State Teachers College
19. New Brunswick, New Jersey	Rutgers Preparatory School
20. Red Bank, New Jersey	Senior High School
21. Roselle, New Jersey	Harrison Avenue Elementary School
22. South Amboy, New Jersey	Harold G. Hoffman High School
23. Sussex, New Jersey	Sussex High School
24. Swedesboro, New Jersey	Swedesboro High School
25. Trenton, New Jersey	State Teachers College
26. Washington, New Jersey	Washington High School
27. Pollocksville, North Carolina	Jones County Training School
28. Charlotte, North Carolina	Second Ward High School
29. Hickory, Pennsylvania	Hickory High School
30. Nashville, Tennessee	Central High School
31. Denton, Texas	Denton Junior High School
32. Denton, Texas	Denton Senior High School
33. Denton, Texas	North Texas State College Junior High School
34. Wortham, Texas	Wortham High School
35. Richmond, Virginia	Thomas Jefferson High School
36. Washington, D. C.	Coolidge High School
37. Washington, D. C.	Eastern High School
38. Washington, D. C.	Eliot Junior High School
39. Washington, D. C.	Gordon Junior High School
40. Washington, D. C.	McKinley High School
41. Washington, D. C.	Roosevelt High School
42. Washington, D. C.	Stuart Junior High School
43. Washington, D. C.	Western High School
44. Green Bay, Wisconsin	West High School

"All but One" Schools—as of December 10, 1950

1. Englewood, Colorado	Englewood High School
2. Decatur, Illinois	Decatur Senior High School
3. Bayonne, New Jersey	Accredited Evening Senior High School
4. Burlington, New Jersey	Burlington High School
5. Caldwell, New Jersey	Caldwell College
6. Millville, New Jersey	Memorial High School
7. Mt. Holly, New Jersey	Regional High School
8. Newark, New Jersey	Barringer High School
9. Passaic, New Jersey	Jefferson Junior High School
10. Red Bank, New Jersey	River Street Junior High School
11. River Edge, New Jersey	River Edge Junior High School
12. Summit, New Jersey	Kent Place School

If Your School Is Not a 100% School

Will you show the announcement on page 137 to those mathematics teachers who are not members and urge them to take advantage of this offer today?

TOPICS OF INTEREST TO MATHEMATICS TEACHERS

Edited by WILLIAM L. SCHAAF
Department of Education, Brooklyn College, Brooklyn, N. Y.

Guidance: The Case for Mathematics

TWENTY years ago one heard very little about "guidance" in high school mathematics. Many students took mathematics only because they were required to do so, or because they were told it was good for them. Other students took no mathematics—having been misguided by well-meaning adults. World War II temporarily usurped the role of guidance counsellor. There was little doubt as to what had to be done.

At the close of the war, the National Council of Teachers of Mathematics created the Commission on Post-War Plans. Under the able and stimulating leadership of its chairman, Raleigh Schorling, this Commission dealt with two major problems: (1) recommendations for the improvement of mathematics in Grades 1–14 (Second Report, 1945), and (2) the preparation of a guidance pamphlet in mathematics for high school students (Final Report, 1947). Schorling addressed himself to these tasks with enthusiasm and untiring effort. Both reports were well received. In particular, the guidance pamphlet filled a long-felt need; nothing of the sort had been available up to that time. Some 35,000 copies have been distributed since its first appearance, which attests not only the gap that needed to be filled, but also the contribution which it has made. Its success is due in no small measure to Schorling's imagination and sincerity; with characteristic patience and determination he welded together data submitted by a score of experts in various fields.

More recently there has appeared a similar pamphlet, sponsored by our Canadian colleagues, entitled *Why Study Mathematics?* An attractively illustrated brochure of 33 pages, addressed to teachers and students, it discusses careers which require an expert knowledge of mathematics, careers which require knowledge of specialized fields of mathematics, careers which require a substantial foundation of mathematical study, the mathematics needed in the education of a competent citizen, the contribution of mathematics to sound reasoning, and the intellectual and aesthetic satisfactions that may be derived from mathematical study.

Although considerable progress has already been made, much still remains to be done. The following would seem to warrant serious consideration:

(1) There should be prepared additional detailed material describing the specific kind and amount of mathematics required for various trades, vocations, industries, business activities, technical jobs, semi-professional and professional positions. This material should probably cover many more fields and occupations than have heretofore been given attention.

(2) Guidance should not be solely directed to students. Appropriate material should also be prepared for teachers of other subjects, as well as for mathematics teachers; for guidance counsellors; for school administrators; for businessmen and industrial leaders; and, of course, for parents. Such material should receive the widest possible dissemination.

(3) Mathematics teachers should become acquainted with the specific nature of the activities in many vocational areas, and particularly with the mathematics used in those areas. Vague or general allusions to "needed mathematics" often

mean little to the uninitiated; a few realistic problems or situations which might be encountered on the job are likely to strike home. The mathematics teacher of the future will himself have had some first hand experience in the machine shop, the drafting room, the laboratory, the office, the factory, or the bank; he will have used the instruments of the navigator, the surveyor, or the engineer.

(4) Overemphasis on the vocational uses of mathematics might well be avoided. Of equal or greater significance are the cultural values accruing from the proper study of mathematics, to say nothing of the importance of mathematical literacy or functional competence for "personal" and "consumer" purposes. In our enthusiasm we may be prone to think more about bread-and-butter values than of intellectual and spiritual values. A sound guidance program must also pay attention to the role of mathematics in the general education of all the students.

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As Others Saw Him

(*Continued from page 107*)

car, and a good sized checking account. He tried to find some special talent or ability in each pupil for which he could be praised and of which he could be proud; then he tried to lead faculty and pupils alike to respect that ability and to bring out all that was best in the afflicted one. That, he insisted, was one of the most important phases of education for life.

"Dr. Schorling was enthusiastic over all sports, although he excelled in only one—fishing. As the years went by and his committees, speeches, and multitudinous writings cut further and further into his leisure time, he dropped out of participation in games, but continued his support of University and High School athletics, and he did still take time off for an occasional fishing trip. It would be hard to guess whether he was happier catching fish or cooking and serving them over an outdoor fire. He was always the 'official cook' for all picnics.

"Another great pleasure of his later years was his vegetable garden. Started as a war-time activity, it became a real hobby.

"Probably he was never as happy as in his own home with his family, to whom he was passionately devoted, or sitting quietly in front of his fireplace visiting with one or two close friends. There one really sensed the depth of his kindliness, his high ideals, and his firm belief in the democratic principles of education."

MARY ANN TUMPERI recently completed her undergraduate work leading to a bachelor's degree and a teachers' certificate under Dr. Schorling's guidance. During part of her undergraduate days she also stayed in the Schorlings' home. Hence she could write:

"Knowing Dr. Schorling was a key to many wonderful friendships for me. I would meet a mathematics teacher or someone in education and the minute I mentioned knowing Dr. Schorling, we were on common ground and were off on a conversation that would last for hours. We would talk on about his wonderful sense of humor, his many accomplishments and of the many favors he did for his friends since he was one of those people who felt that if you were worthy, he would go all out to help you.

"As a member of his class you were very much aware of his keen mind. In fact it

(*Continued on page 148*)

NOTES ON THE HISTORY OF MATHEMATICS

Edited by VERA SANFORD
State Teachers College, Oneonta, New York

The Art of Reckoning

IV. ALGORISMS: COMPUTING WITH HINDU-ARABIC NUMERALS

THE introduction of Hindu-Arabic numerals in Europe was a slow process. The use in Europe of these numerals with their positional value and their symbol for zero dates from the latter part of the tenth century. The earliest certain use of these numerals in a manuscript is in a work written in Spain in 976. The earliest description of the use of these numerals in computation in Europe is in a manuscript of about 1130. The title of this work *Algoritmi de numero Indorum* suggests that it is a translation of the work on computation by the Arab scholar al-Khowârizmî (*c.* 825) which is no longer extant. Certainly the word "Algoritmi" is derived from the name al-Khowârizmî and this name in the form "algorism" has been applied to the small treatises sometimes in verse, sometimes in prose, telling how to use the new numerals—treatises that appeared in considerable number in the twelfth though the fifteenth centuries. These were written in Latin, in Hebrew, English, Italian, French, and even in Icelandic. As might be expected, these were often very similar. Among the most copied were the manuscript mentioned above which is variously attributed to Adelhard of Bath and to Robert of Chester, the *Algorismus Vulgaris* attributed to Sacrobosco (*c.* 1230), and the *Carmen de Algorismo* written by Alexandre de Villedieu (c.1225).

Some of the algorisms were very brief, giving the processes alone. Others coaxed the reader along, encouraging him, telling him how to check his work, congratulating him on successful accomplishment. Even at the risk of confusing the reader, a patchwork of citations from different algorisms gives a better idea of their content than would quotations from a single one. The quotations that follow are taken from the translations of two French Algorisms made by E.G.R. Waters, quoted by the kind permission of the editor of *Isis*, Dr. George Sarton.

A thirteenth century algorism begins with a statement of the importance of the subject and states that four of the Seven Liberal Arts, arithmetic, geometry, astronomy, and music, cannot be learned unless one knows how to reckon any more than the other three, grammar, rhetoric and logic, can be mastered if one does not know how to write.

A fifteenth century algorism has this beginning:

> "Here follows the noble and subtle science which is called the calculation of algorism. . . .
>
> "Algorism is a system of numbering. If one employs that system when reckoning rapidly, without doubt it is a form of reckoning which tells no lie on any exact point; it has a high reputation for accuracy, and is otherwise known as the system of arithmetic. It forms a part of mathematical science, as also does that branch which is seldom idle, called the very noble teachings of the abacus. The present branch teaches how to reckon and to calculate by means of the combination of the nine figures and the cypher, to multiply one set of figures by another without contestation, to split up, and to divide, thus separating one from the other. It is a very noble science. He who encloses it in his mind has forthwith speedily learned it, if he has acquired accuracy in the use of it. I tell you and inform you, then, that he who wishes to know algorism should listen carefully to this poem, and continue to do so until the end . . . for he who wishes to profit by it must know the whole of it. And if he will remember it well, he will be able to carry out many reckonings without a mistake, and to effect them with the greatest imaginable speed, as you shall see hereafter provided you do not relax your attention."

Thus admonished, the reader goes on to a description of the ten numerals and the idea of place value. But for that, we quote from the thirteenth century Algorism, where the numbers are classified as digits, articles (i.e., multiples of 10) and composites (two-digit numbers, an article and a digit).

"When you are able to recognize each figure according to its nature, and what each signifies, then know, and have no doubt, that each one when first in a number has just its own value without any other number. In the second place it is worth ten times as much as in the previous place. In the third place it embraces ten times as much as in the second place, and in the fourth place it contains ten times as much as in the preceding third place. You can see this in the following manner, which may seem easier to you: if you put a figure in the first place, it is worth units, in the second it is worth tens, in the third place hundreds, and in the fourth place it denotes thousands; if it goes beyond a thousand, on no account forget to always multiply by ten whatever you write in successive places. These figures . . . are not sufficient for reckoning without this one: 0, called naught, which is worth nothing, creates nothing but shadow, to such an extent does it encumber the ground, yet no article can ever by written in any work without it; of itself it can bear no fruit, but it gives significance to others."

The topic of addition as given in these works shows either that the addition combinations were known or that the computer had some method of deriving them as needed. The description of addition tells that the numbers are to be arranged with the smaller close below the larger, the first figure of the one beneath the first figure of the other and so on. The work begins on the right and the sum is written above the numbers. The reader is told that the sum of two digits will be another digit, a composite, or an article. The directions then read:

"If it (the sum) is a digit, one should remove the figure above it, and make in its place another figure worth as much as the two were worth which were there before. And if on adding it befalls you that you have to make an article, you must make a cipher in that place above, move your unit (which was worth ten) farther on, and add it to the figure next beside it; and if the figure is nine, make me a cipher in the proper manner, and you must join your unit with that which you find next after it. If further it befalls you on adding that you have to encounter a composite, then write a digit in the place above, and carry over the article alone to the next place. . . . When no article at all is left in the place where it was, your addition will be complete."

Subtraction has offered difficulties for many computers. The algorisms covered the subject in a short section.

"If you wish to take away one number from another, you must write your greater number over and above the smaller, in just the same way as you did in addition; for no one can by subtraction, whatever he may so subtract a great from a small number, but the great can very well compress itself and allow itself to be made smaller. And if you wish to subtract, begin on the right, and subtract towards the left, and take away the under from the upper figure in the proper manner. Sometimes you will not be able to take it away, when you see them equal; or you will find the upper figure much smaller than the lower. If it is equal, you must remove it and put your cipher there. If it is smaller, borrow a ten from the next figure, i.e., one, which will be worth ten. These ten must be added to the preceding figure—not, however, in writing, but you must set it down in your mind. When you have to borrow your ten, you must reduce the upper figure; you will afterward subtract the lower from it. Sometimes you will find a cipher there; if it does happen that you find it to contain nothing that you can borrow, you must pass beyond the cipher, and from the figure that you find next to it borrow a unit. And know for certain that no borrowed unit could ever be brought under a cipher when one is subtracting, without making it into a nine. When you have brought it into its place, then the figure below must be subtracted from the number that you have above, and you must leave the remainder there. You will know how to add and subtract if you can do as I tell you. And know that subtraction is proved by addition; and he who knows well how to do it proves addition by subtracting."

In many cases, multiplication was preceded by duplation or doubling and division was preceded by mediation or halving.

Multiplication is treated in a variety of ways. In one case, multiplication involves six rules. These cover the product of two digits, a digit by an article, a digit and a composite, two articles, an article and a composite, and two composites. Occasionally rules are given to help in finding the products. A device that appears for finding the product of two large numbers (digits greater than 5),

of finding the square of a number, is this: to find the square of a number, find the difference between 10 and the number and subtract this from the original number. This difference is the ten's digit of the square. The unit's digit is the product of the difference by itself. Thus to find the product of 8 by 8, since $10-8$ is 2 and $8-2$ is 6, the ten's digit of the square is 6 and the unit's is 2×2 or 4. To find the product of two digits, find the difference between 10 and each of the numbers. The ten's digit of the product is the number found when the difference between 10 and the smaller number is subtracted from the larger number. The unit's digit is the product of the two differences. Thus 8×9 has 2 and 1 for the two differences. The ten's digit of the product is $9-2$ or 7, and the unit's digit is 2×1 or 2. Thus the product is 72.

Division is a complicated process. One definition of division is this:

> "Division is when one can have two numbers, and it is necessary to find from these two a number which can be taken away from one's greater number as many times as there are units in the lesser. With less than two numbers the operation is impossible."

No rule seems to be given for determining the proper quotient figure.

Several of the algorisms also included sections on the sum of arithmetic progressions, and a few also include square root. The author of the thirteenth century algorism from which a number of quotations have been made, says that the square root requires close attention which is no exaggeration considering the way in which he went about it. The reader is cautioned not to be bewildered and the explanation ends with this statement

> "If you wish to test whether you have calculated properly and your root is correct, multiply it forthwith by itself, and add to the resulting number what is left over from the quadration; on putting them together thus, you will see the original number. Then be joyful if you have extracted your root correctly."

Certain of the algorisms as for instance the anonymous Italian algorism in the possession of Columbia University contained puzzle problems as well as the directions for performing the operations of addition, subtraction etc. These problems in the Columbia Algorism are of the familiar type—a boatman takes a fox, a goose and a head of cabbage across a stream in a boat which will carry the boatman with one of these, but not two and where the fox left with the goose will eat the goose and the goose left with the cabbage will eat it. The Algorism also has the problem of the 8, 5, and 3 measure jars with 8 measures of liquid in the largest the problem being to measure out one unit of the liquid without using any other container.

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DEVICES FOR A MATHEMATICS LABORATORY

Edited by EMIL J. BERGER
Monroe High School, St. Paul, Minnesota

This section is being published as an avenue through which teachers of mathematics can share favorite learning aids. Readers are invited to send in descriptions and drawings of devices which they have found particularly helpful in their teaching experience. Send all communications concerning Devices for a Mathematics Laboratory to Emil J. Berger, Monroe High School, St. Paul, Minnesota.

THE CENTROID DEMONSTRATOR*

THE principal use of the device suggested in this article is to demonstrate that the medians of any triangle are concurrent. As will be shown later, however, the device can be used to illustrate a number of other interesting geometric principles. While the drawings included here may appear somewhat complicated at first sight, close inspection will reveal that the actual construction is not. Boys studying plane geometry will find building and manipulating this particular device both interesting and challenging because its mechanical features are somewhat different from the usual type.

The device consists essentially of four parts: sides AB and BC of triangle ABC, the base box, and the block which slides lengthwise inside the base box. (See Fig. 1.) The following materials are suggested for building the centroid demonstrator:

* Plans for the construction of the Centroid Demonstrator were developed in the Mathematics Laboratory, Monroe High School, St. Paul, Minnesota.

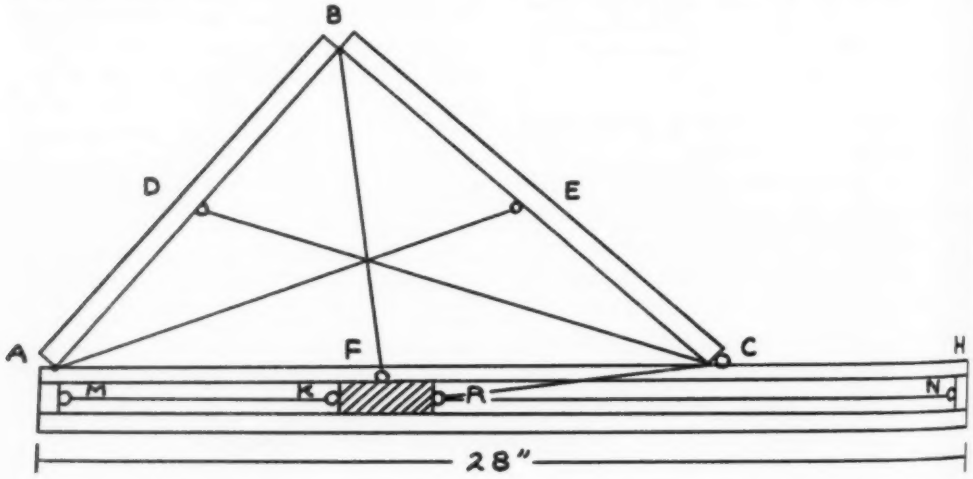


FIG. 1. Diagram of Centroid Demonstrator with one side of base box removed.

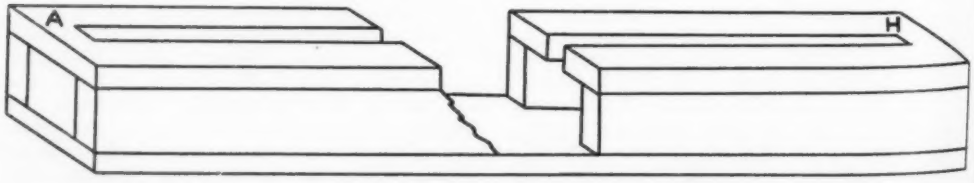


FIG. 2. Diagram of base box illustrating inside and cross section construction.

Side AB	1 piece of pine	$\frac{3}{4}'' \times \frac{3}{4}'' \times 12''$
Side BC	1 piece of pine	$\frac{3}{4}'' \times \frac{3}{4}'' \times 14''$
Base box	2 pieces of plywood	$\frac{1}{4}'' \times 2\frac{1}{4}'' \times 28''$
	2 pieces of pine	$\frac{3}{4}'' \times \frac{3}{4}'' \times 28''$
	2 end pieces	$\frac{3}{4}'' \times \frac{3}{4}'' \times \frac{3}{4}''$
Block KR	1 piece of pine	$\frac{5}{8}'' \times \frac{5}{8}'' \times 1\frac{1}{2}''$

Hardware and miscellaneous items which are needed include two small brass hinges ($\frac{3}{4}''$ wide), eight screw eyes, one piece of strong lightweight cord, and a supply of rubber binders.

Figure 1 shows how the device is assembled and how it operates. Side AB is fastened to the base box at A with a brass hinge. AB and BC are joined together at B also with a hinge. C at the end of BC is free to slide along AH.

The base of the device is in the form of a closed hollow rectangular box with a slit AH cut in the top side. (See Fig. 2.) This slit should be $\frac{1}{4}''$ wide and $26''$ long. Actually the top of the box could be made from two separate strips each $15/16''$ wide and $28''$ long. The inside dimensions of the box must be such that the block ($\frac{5}{8}'' \times \frac{5}{8}'' \times 1\frac{1}{2}''$) will be able to slide freely from M to N. Fastened to the block are three screw eyes—one at K, one at R, and a third at F. The one at F should be turned sideways so that it may slide along the slit AH in the top of the box. Other screw eyes are located at D and E (midpoints of AB and BC respectively), at M and N on the inside ends of the base box, and at C on the lower end of BC. The one at C should be turned sideways so that it also may slide along the slit AH. Rubber binders are strung between the points A and E, D and C, B and F, and M and K. A piece of cord is tied to the eye at N, passed through the eye at R, and tied again to the eye at C. The exact length of cord needed can be determined by fixing the position of C along AH, and then pulling the cord through C until F is at the midpoint of AC. It will be noted that the rubber binder MK acts like a spring on the block in the direction KM, and that the screw eye at R serves the same purpose as a pulley. After the cord is tied at C, the eye to which it is tied may be moved along the slit AH. F will be at the midpoint of AC for any position of C along AH.

That the device may now be used to show that the medians of any triangle are concurrent is easily apparent. If C is located along AH so that $BC = AC$, then we have an isosceles triangle and the medians AE and BF are equal. As another suggestion, remove the rubber binders which represent the medians and stretch them between the points D and E, E and F and F and D. Now we have four congruent triangles, each similar to triangle ABC and one-fourth as large. By using the rubber binders appropriately many theorems relating to the parallelogram can also be demonstrated with this device.

Adjustable Volume Device

This is a visual aid that can be used advantageously on the junior high school level for teaching the concept of volume.

The device illustrated in Figure 3 consists of three main parts: a base, an upright block, and a movable shield. The base is a piece of board $\frac{3}{4}'' \times 6'' \times 12''$. It is marked off into fifty square units as indicated. Down the center of its length a groove is cut through wide enough to accommodate a $3/16''$ bolt. The upright block is a piece of board $1'' \times 3'' \times 5''$. The marks indicating cubic inches appear on both sides of it and may either be painted on the surface or grooved with a saw. Brads to which rubber binders may be hooked are driven in at vertices A and B. In the device pictured here the block is fastened to the base with wood glue, but nails or screws may also be used.

The movable shield may be made of tin, plastic, or plywood, but tin is probably the most practicable material to use because it can be bent up at the bottom to form a lip with the vertical. (See Fig. 4.) Doing so will make the shield more rigid. The face of the shield must be $3''$ high and $5''$ wide, and it must be marked off into square units which correspond in number

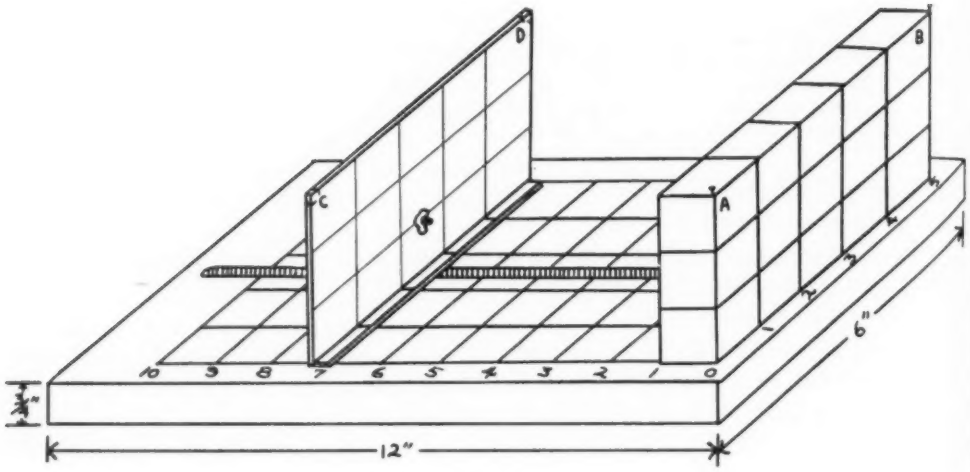


FIG. 3

and position to those on the face of the upright block. The corners at C and D are grooved so that rubber binders may be hooked between C and A, and D and B. On the back side of the shield is a 90° angle iron. Through its horizontal arm there are two 3/16″ bolts with wing nuts. The heads of these bolts extend below the groove in the base. Thus the shield may be moved back and forth and adjusted as desired.

The device is completed by stretching rubber binders between C and A, and D and B. Thus a rectangular box is clearly outlined. The device is so constructed that the concept of volume may be taught by the "layer method." Starting with the area formulas students may be led to visualize a cubic unit upon each square unit of the base. The upright block is to be taken as the first layer of cubic units. It is marked off in such a way that the number of cubic units in this layer may actually be counted. The markings on the bottom side of the box make it possible to count the number of layers needed to fill the box. The size of the box may be varied by shifting the position of the movable shield. In this way students may be given a variety of exercises in the calculation of changing volumes.

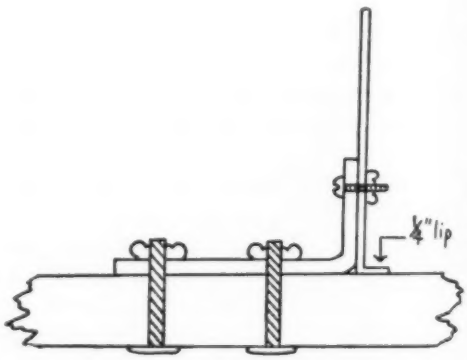


FIG. 4

Marvin L. Johnson
Rochester Junior High School
Rochester, Minnesota

National Council Members

Have you read the suggested revisions of the N.C.T.M. By-Laws appearing on pages 109–110? Please study them carefully and send your comments to any member of the Committee within the next two weeks, or bring them with you to the Annual Business Meeting at Pittsburgh on Thursday, March 29, 1951.

APPLICATIONS

Edited by SHELDON S. MYERS
University School, Ohio State University, Columbus, Ohio

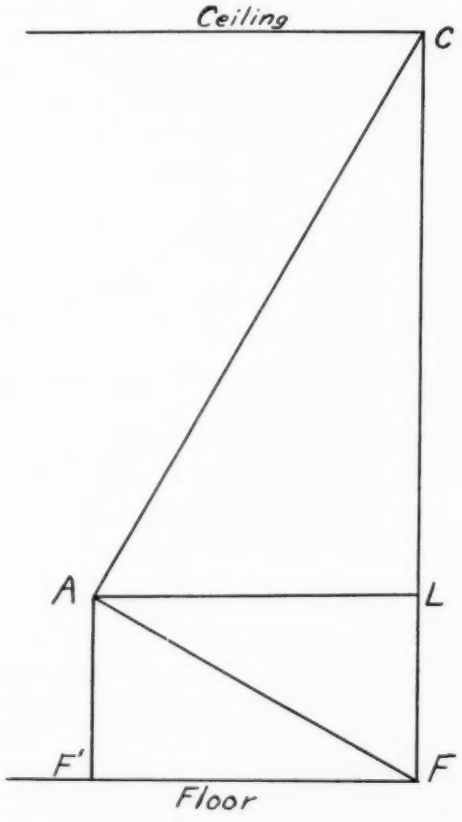
WE ARE pleased with the letters that are being received about "Applications." Both contributions and criticisms are welcome. Some letters which correct errors will be mentioned in the department, such as the one by M. H. Ahrendt of Anderson College, Anderson, Indiana, who discovered in T. 1 "Measuring the Earth's Circumference" that the length of the Kalamazoo shadow should be 56.99, not 53.99 inches, and the one by Paul J. Eby of Boston University, who refined the opening sentence in Ar. 2 "Aliquoting" as follows: "Ten grams of a substance are dissolved in a reagent to make 100 ml. (milliliters) of solution." This a more precise statement of actual practice. However, we shall try to answer all letters directly by mail.

P.G. 2. Gr. 10–12. FINDING THE HEIGHT OF A ROOM WITH THE AID OF A PLANE GEOMETRY THEOREM

"The altitude on the hypotenuse of a right triangle is a mean proportion between the segments of the base" is a theorem of plane geometry which is usually presented because of its role in developing other theorems, rather than for any immediate practical use. It is possible to show the use of this theorem in a very effective classroom project. A measuring stick or tape measure and an angle mirror[1] are needed.

Briefly, the angle mirror locates the vertex of a right angle whose imaginary legs pass through two given points. In the drawing below, point C is on the ceiling, point F is on the floor, while point A is found with the angle mirror. Angle CAF is a right angle. It is convenient to make CF a wall.

[1] Berger, Emil. "Devices for a Mathematics Laboratory." THE MATHEMATICS TEACHER, 1950, vol. XLIII, 6: 287–288.



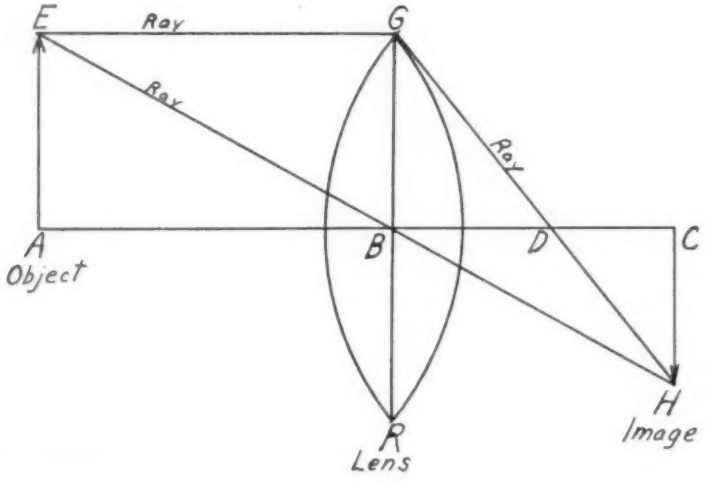
In $\triangle AFC$, AL is the altitude on the hypotenuse, while FC is the hypotenuse. The above theorem gives us the following relationship:

$$\frac{LC}{AL} = \frac{AL}{LF}.$$

AL is the distance of the angle mirror from the wall and AF' is the distance of the angle mirror from the floor, both of which can be measured easily. Since $AF' = LF$, the distance LC can be computed. The sum of LC and LF gives the height of the room. A 40-minute period is more than adequate for students to receive preliminary instructions, perform the measurements, and check results with a ladder.

P.G. 3. Gr. 10–12. Use of Similar Triangles in Deriving the Law of Lenses

This application is admittedly for the more able student in mathematics and science, especially if he is asked to go on his own power from step one below to step six. The lens law is a formula in physics



relating the object distance, the image distance, and the focal length of any convex lens. The close relation between plane geometry and optics is well known, Euclid, himself, writing a book on geometrical optics.[2]

Given Data: AC (principal axis) bisector GR

$EA \perp AC$, $CH \perp AC$, $EG \parallel AC$

D is the principal focus

$O = AB$ distance of object from lens

$I = BC$ distance of image from lens

$F = BD$ focal length of lens

Problem: Find a relationship, if any, between I, O, and F. First prove $\triangle ABE \sim \triangle BCH$ and $\triangle BDG \sim \triangle DCH$.

(1) $\dfrac{CH}{AE} = \dfrac{BC}{AB}$ $\qquad$ $\dfrac{CH}{AE(BG)} = \dfrac{DC}{BD}$

(AE is substituted for BG)

(2) $\dfrac{BC}{AB} = \dfrac{DC}{BD}$

(3) $\dfrac{AB + BC}{AB} = \dfrac{BD + DC}{BD}$

(4) $\dfrac{AB}{AB} + \dfrac{BC}{AB} = \dfrac{BC}{BD}$

(5) $\dfrac{AB}{AB \cdot BC} + \dfrac{BC}{AB \cdot BC} = \dfrac{BC}{BD \cdot BC}$

(6) $\dfrac{1}{BC} + \dfrac{1}{AB} = \dfrac{1}{BD}$

(7) $\dfrac{1}{I} + \dfrac{1}{O} = \dfrac{1}{F}$ (The Lens Law).

Ar. 6. Gr. 7–9. Animal and Bird Speeds

The following set of problems were used in 1937 by Dr. Charles C. Weidemann, now retired from The University School and Ohio State University. These problems would obviously lead to many interesting discussions and comparisons by junior high school pupils.

1. The sparrow averages 17 miles per hour or _____ feet per minute.
2. The seagull at 30 miles per hour averages ½ mile per minute or _____ feet per minute.
3. The crow averages 1 mile per minute or _____ miles per hour.
4. The pigeon averages 67 miles per hour or _____ feet per minute.

[2] Smith, D. E., *History of Mathematics*, New York: Ginn and Co., 1923, vol. I, p. 106, vol. II, p. 338.

5. The duck hawk averages 3½ miles per minute or _____ miles per hour.
6. An elephant can average 32 miles per hour or _____ feet per minute.
7. The greyhound can run ¼ mile in 25 seconds or _____ miles per hour.
8. The jackrabbit for a short distance can run at the rate of 1 mile in 1½ minutes or _____ miles per hour.
9. A race hourse has run at the rate of 59 miles per hour over a 2 furlong course, or _____ feet per minute.
10. The antelope runs at the rate of 62 miles per hour or _____ feet per minute.
11. The lion can run at the rate of 68 miles per hour or _____ feet per minute.
12. A duck hawk's speed is how many times that of a sparrow? _____
13. How do the speeds of a pigeon and a lion compare? _____
14. How do the speeds of a seagull and an elephant compare? _____
15. A greyhound on the average runs slower than a jackrabbit. Give three reasons which explain the fact that greyhounds catch rabbits.
16. How do speeds of crows and antelopes compare? _____
17. An elephant's speed is _____ as fast as a lion's speed.
18. Arrange the animals named above in the order of their speed.

S.G. 1. Gr. 11–12. Solid Geometry and the Law of Inverse Squares for Light

An important solid geometry theorem can be used to deduce the law of inverse squares for light radiation.

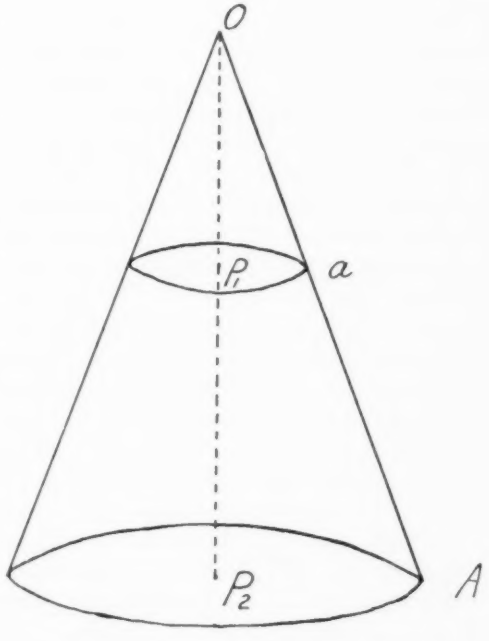
A flashlight at O is shining downward, first on a circular surface of area "a" at P_1 and distance "d" from O, and second on a circular surface of area "A" at P_2 and distance D from O. These two surfaces form the bases of two right circular cones with O as the common vertex. By a solid geometry theorem it is known that the following relationship exists with respect to the two cones:

$$\frac{a}{A} = \frac{d^2}{D^2}.$$

It can be experimentally determined or intuitively assumed that the light intensity varies inversely as the area over which it is spread. The same amount of light from O falls on a bigger area at P_2 than at P_1. In this case one can assume that the bigger the area, the weaker the light. Therefore:

$$\frac{L}{l} = \frac{a}{A}.$$

Where L is the light intensity at P_2 and l is the light intensity at P_1.



It follows from these two relations that:

$$\frac{L}{l} = \frac{d^2}{D^2}.$$

The verbal statement of the relation is known as the "law of inverse squares for light" and is here given: The intensity of light varies inversely as the square of its distance from its source. Suppose that the distance at P_1 was 2 inches and at P_2 was 6 inches, or 3 times as much. Then:

$$\frac{L}{l} = \frac{2^2}{6^2} = \frac{4}{36} = \frac{1}{9}.$$

This means that the light at P_2 would ⅑ as strong as at P_1.

AIDS TO TEACHING

Edited by

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and

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BOOKLETS

B.54—Let's Measure Things

Cornell Rural School Leaflet; New York State College of Agriculture, Cornell University, Ithaca, New York

Booklet; 9″×6″; 63 pages; 1948; $.35.

Description: One of the unique features of this pamphlet is the broad field of measurement and units of measure that it covers. The main topics are; "Measuring Space," "Measuring Areas," "Measuring Volume," "Time, What is Time?", "How Much Does It Weigh," "Measuring Numbers," "Measuring Position," "What is Temperature?", "Let's Measure Humidity," and "Let's Measure Speed." The first topic is especially elaborate for it includes, not only the common linear measurements, but also many meaningful items such as; "Measurement in Athletics," "Measurement of Interest to Hunters and Fishermen," and "Measurements in the Carpenter Shop." Interesting and helpful student activities include judging of distance, measuring heights and how to make a sundial. Very complete tables of units are given with all of the topics studied.

Appraisal: Here will be an invaluable aid to the teacher during the study of measurement and its practical use in other countries as well as ours. It is felt that more use could have been made of illustrations such as picto-graphs especially when studying speed. An index or table of contents would have helped when using this pamphlet as a classroom reference. Both student and teacher will be able to use this leaflet. The material covered and the method of presentation make it useful for intermediate and senior grades as well. (Reviewed by Lloyd W. Green, Central High School, St. Paul, Minn.)

B.55—Brain Resters and Testers

Cooperative Recreation Service, Delaware, Ohio.

Booklet; 25 pp.; 4″×7″; Single copies—$.25.

Description: This booklet contains thirty-six clever puzzles, tricks, and games. Most of the tricks are mathematical such as dividing 28 by 7 to get a quotient of 13 or how to construct a magic square. Others such as "Doublets" and "Mind Reading" are not mathematical. Answers are provided for those who get weary.

Appraisal: The mathematics teacher will find this inexpensive booklet a source of entertainment for her classes. Tricks such as how to tell the age of a person, stunts such as spelling card numbers as they turn up, problems such as how to make magic squares or games such as the Fifteen Game stir up interest from the dull to the bright. It's worth a quarter.

CHARTS

C.20—National Forum Social Studies Charts

National Forum Inc.; 407 S. Dearborn St., Chicago 5, Illinois

Charts; 17″×22½″; $17.00 per set (with masonite easel)

Description: Thirty-one charts are lithographed in very attractive colors on heavy white paper. The set is subdivided into eight sections according to the concepts

portrayed: (1) Principles of Economics, (2) Purchasing Power, (3) Money and Prices, (4) Economic Organization, (5) Technology, (6) Labor, (7) Farm, and (8) Conservation. Important current economic data are pictured by means of simple drawings and pictographs. The latter form is used quite effectively to stress quantitative comparisons, whereas the former indicates economic relationships.

The set is bound within a heavy black cardboard cover which serves as an easel during display.

The bold drawings employed to visualize the concepts are large enough to be seen from a distance and the easel facilitates display of the charts.

A mimeographed booklet contains two pages of pertinent information to accompany each of the charts. The information and references given are quite helpful in enabling the teacher to direct student discussions and to prepare assignments.

Appraisal: Widespread recent revisions in the junior high school curriculum have emphasized the desirability of teaching socialized mathematics at the lower grade levels rather than the elementary pure mathematics which is taught primarily for the benefit of those students who intend to take college preparatory courses in high school.

Although the charts are designed for social studies classes, they are very useful in helping the mathematics teacher to develop those economic concepts which underlie the new socialized nature of the subject. In the light of present general objectives, the social nature of mathematics can hardly be ignored. In fact, the problems of the newer junior high school texts are drawn largely from current economic conditions.

The simplicity of the charts enhances their clarity and the very fact that they are up-to-date and dramatic in presentation can contribute to the reduction of abstractness.

The charts would probably be too expensive if their usefulness was limited to the teaching of mathematics; since they are exceptionally effective in teaching current affairs, however, their advantages may be utilized by both the mathematics and the social studies departments. This dual effectiveness would certainly make the high price less objectionable.

Other charts prepared by the National Forum Company are useful in teaching mathematics but cannot be purchased individually. The price of seventeen dollars for an entire set would be prohibitive if only a small fraction of the charts were to be used. An excellent example of such a situation arises in the case of a set called "Government." Six of the thirty-one charts are concerned with taxation: 24. "Sources of Revenue," 25. "Where the Tax Dollar Goes," 26. "The Federal Debt Load," 27. "Who Pays the Sales Tax?". The only justification for purchasing these would be for teaching social studies; they could then be borrowed for teaching mathematics. (Reviewed by Bernard Singer, Hyannis, Mass.)

EQUIPMENT

E.36—Visualizer

Vis-X Company, 1049 South Flower, Los Angeles, Calif.

Cabinet Table; 36″×36″×18″; 3″ plywood; $92.50.

Description: The Visualizer is a multipurpose cabinet, 36″ long, 36″ high and 18″ side, made of 3″ plywood in natural finish. It has two drawers, one 3″ and the other 7″ deep, and two shelves, all designed to hold smaller visual materials. The front panel is a square yard. Each of the sides is also a square yard when the doors are open. By folding back the hinged false top to rest on the doors, a cubic yard is formed. The lateral surfaces of the cubic yard are divided into square feet by yellow lines. A graph chart, ruled in inch squares, is glued to the under side of the front panel that is hinged at the

top. When raised to an upright position and fastened by a simple device to the partially lifted false top it is ready for use. The under side of the false top is heavily coated with black flock and when opened to position for use as a demonstration board, rests on a support concealed in the upper drawer. It is equipped with casters and handles to move it easily.

Appraisal: The Visualizer is a practical visual aid for developing concepts of linear, square and cubic measures. Higher than a regular desk, it provides a demonstration desk and also a solid table for the projector or other machines. It may be moved to any part of the room to secure proper lighting or to another room for use by the same or other teachers. The ever-ready solid-back graph board is easier to use than those that roll away in a case. It may serve as a display board for large charts, pictures, etc., by clipping them to the side or top of the board.

The flocked demonstration surface of the false top holds the plane geometric figures or other similar materials more securely than backgrounds of velour paper or flannel. Since the upper drawer is partly open when this demonstration board is in use, it is a convenient storage place for the small items, either commercial or teacher made, that are being used. The second drawer keeps the larger items orderly and convenient. There is space for the cubic foot at one end of the lower shelf and special places for additional materials needed in senior high school mathematics. The other shelf provides space for pictures and charts usually difficult to store. The Visualizer is intended for use with many smaller and less expensive visual aids and becomes increasingly more valuable as they are added. (Reviewed by Alice M. Phillipson, Mathematics Consultant, Los Angeles, Calif.)

E.37—Demonstration Case

Vis-X Company, 1049 South Flower, Los Angeles, Calif.

Case; 2″×19″×28″; $5.00.

Description: This demonstration case is made of plywood 2″×19″×28″. It has a handle on one side so that the case can be carried like a suit case. The lid is hinged at one side and has hooks to hold it firmly in place on the other sides. The under side of the lid, like the false top of the Visualizer, is flocked and when raised to the proper angle is supported by a long hook. The body of the case, like the upper drawer of the Visualizer, is the storage space for small disks or materials used on the demonstration board, as well as the circle, linkages, etc.

Appraisal: This small case does not have the storage space, graph board, etc., the Visualizer has. But it does provide a convenient flocked demonstration board and storage for the materials used with it such as the plane geometric figures, which are useless without such a board. It is a good substitute for those who cannot purchase the Visualizer. (Reviewed by Alice M. Phillipson, Mathematics Consultant, Los Angeles, Calif.)

INSTRUMENTS

I. 29—Blackboard Drawing Set (No. 1298)

J. L. Hammett Company, Kendall Square, Cambridge 42, Mass.

No. 1298; $7.80.

Description: The hardwood drawing set consists of four items—a twenty-four-inch T-square, thirty-six-inch straight edge, twenty-four-inch triangle, and a fifteen-and-one-half-inch protractor. The joint at the stem and cross-bar of the T-square is reinforced by a wooden brace. The long leg contains a two-foot ruler graduated in eighths of an inch.

The straight edge is a three-foot rule graduated in eighths of an inch. The thirty-degree right triangle also has a two-foot rule printed upon its longer leg. The protractor has its angular calibrations printed at one-degree intervals.

Appraisal: The entire drawing set is hardly necessary because the straight edge and protractor may be used to draw any

diagrams which could be drawn with the aid of the entire set. The instruments are well made but suffer from the fact that graduations are not sufficiently visible to be seen by the students during blackboard demonstrations; the visibility of markings upon the protractor is especially poor. Each instrument contains a small round knob which serves as a handle for positioning. Holes are provided in each tool for hanging against the wall when not in use. A straight edge and protractor are essential items in every mathematics classroom. Fortunately, the items in this set may be purchased individually. (Reviewed by Bernard Singer, Hyannis, Mass.)

MODELS

M. 16—Geometrical Solids and Surfaces

Central Scientific Co., 1700 Irving Park Rd., Chicago 13, Ill.

(Order #174110) $7.50 per set

Description: The set contains 24 unpainted wooden solids, 17 bristol board plane figures, and three wires bent to represent angles. The set is packed in a durable wooden box. The solids included are: triangular, square, hexagonal, and octagonal prisms; cylinders, cones, conic sections, sphere, hemisphere, ellipsoids, ovoids, and models to represent the intersection of a cone and cylinder. The plane figures represented are: acute, right, obtuse, isosceles and equilateral triangles; square, pentagon, hexagon, octagon, circles, semi-circles, ellipse, and oval. The bent wires illustrate acute, right, and obtuse angles.

The wooden models are well constructed and the light wood enables them to be seen from a distance regardless of the fact that they are only 1½″ to 3″ high. The bristol board surfaces are sufficiently durable to withstand much handling but the wire angles are small and easily bent out of shape.

Appraisal: The models should be quite useful for aiding students to visualize the figures whose characteristics they study. Such help is certainly needed for many students are weak in ability to "see" spatial relationships, even when a two-dimensional diagram is provided. The use of such concrete objects along with diagrams can contribute to the development of this ability. Likewise, when referring to an octagonal prism, the teacher should be able to eliminate misunderstandings by demonstrating a model which may be examined.

Teachers will benefit from similar use of the bristol board figures. The usefulness of the set for teachers of Algebra II is probably limited to use in explaining the reason why the parabola, hyperbola, ellipse, and circle are called "conic sections." Students of general mathematics may determine areas and volumes of the models.

The aids should be kept in a convenient place where they will be available whenever they might facilitate understanding. In such situations the appropriate model should be passed among the students for examination. Another effective use would be to display the models and have the students determine where these mathematical forms appear in nature and industry.

This set of models is quite expensive; many schools which have carpentry workshops may prefer to construct their own sets. (Reviewed by Bernard Singer, Hyannis, Mass.)

PICTURES

P. 10—Geometric Designs

Division of Photography, American Museum of Natural History, Central Park W. at 79th Street, New York 24, N. Y.

Photographs of geometric forms in nature and industry

Description: The museum's collection of 175,000 negatives includes many which illustrate geometric shapes in nature and industry. A list is available from the museum. The Division of Photography fulfills request for excellent prints of the nega-

tives; glossy contact prints are furnished unless the teacher request other sizes. Enlargements are made according to desire; reductions are made at a minimum cost of twenty-five cents. When ordering, it is necessary to state whether the prints are to be used for education, reproduction, advertising, etc. The size and price of *contact prints* are determined as indicated below:

1.	5″ × 7″	$ .25
2.	4″ × 5″	.10
3.	8″ ×10″	.50
4.	6½″× 8½″	.40
5.	11″ ×14″	1.00

Appraisal: The importance of geometric forms in nature and industry can certainly be overdone; yet, the fact that some teachers mistakenly give a place of major importance to the topic is not sufficient justification for eliminating its study. It is worthy of mention and may result in a greater appreciation of mathematical beauty and increased interest in geometry.

The entire set of pictures is hardly necessary for the attainment of the two general objectives mentioned above. The number of pictures purchased and those selected are dependent upon the funds available and the individual preferences of teachers. The prices of these prints are certainly reasonable. (Reviewed by Bernard Singer, Hyannis, Mass.)

As Others Saw Him

(*Continued from page 134*)

always kept you very alert and on your toes. In class he often showed his amazing ability to organize material and to summarize a long class discussion. I remember his telling us a story when he came back from Washington, D. C. He had worked there for a year on a navy training program. He attended a meeting along with some important navy officials. After a few hours of discussion he was called on to summarize. He did this and also pointed out, in all frankness, that they weren't achieving their goal. This is another trait which I admired in him—his frankness. You always knew exactly what he thought and where you stood.

"It always amazed me what a deep faith he had in people. When he told you that he thought you could do a job and do it well, he almost had you believing it too. This really means a lot to a person, to know that other people have faith in you.

"I still have not fully realized that we will not see him again. I know I will never feel that he is gone—there is still too much of him around. So many things that he helped plan—so many books he has written that sound like him talking. He liked to put the names of people he knew into his textbooks. Many a time a delighted youngster (maybe the family butcher's son) would beam and say that Dr. Schorling had put his name in a math book.

"He had one favorite story which he liked to tell about a teacher who happened to eat near him on a diner. They started talking about Schorling's *Student Teaching!* He got a lot of criticisms from her on the book. (All this without knowing who he was.) In fact he kept pointing out weak spots of the book and leading her on in the criticisms. When she finally got up to leave, he told her who he was and you can well imagine her reaction. He claimed that it was a good way to find out what people really thought of his writing.

"He liked to try new things. I remember his bringing home an expensive gadget that would make juice out of solids such as carrots. Mrs. Schorling wasn't very keen on the idea, for she didn't think the gadget was worth the money. So one afternoon he tried to make a concoction out of carrots, raisins, and other vegetables. He made the mistake of unscrewing the glass container which had no bottom except the beater. He should have just poured the fluid out. Anyway we did a rush job of cleaning up the floor before Mrs. Schorling got home."

MATHEMATICAL RECREATIONS

Edited by AARON BAKST
School of Education, New York University, New York 3, N. Y.

IN THE January issue of THE MATHEMATICS TEACHER the following problem was proposed. "Divide the area of a circle into n (n, any integer) equal parts, but the division of the circumference of the circle is not permitted, nor is the drawing of concentric circles or of parallel chords permitted."

The solution of this problem is as follows. Since n is any integer, we shall take a specific case, say, $n=6$.

Let the radius of the circle be r. The area of the circle is πr^2. Divide the diameter AB of the circle into six equal segments. This division may be performed by means which are generally developed in the first course in high school geometry. Thus, we have that $AB_1=B_1B_2=B_2B_3=B_3B_4=B_4B_5=B_5B=\frac{1}{3}r$.

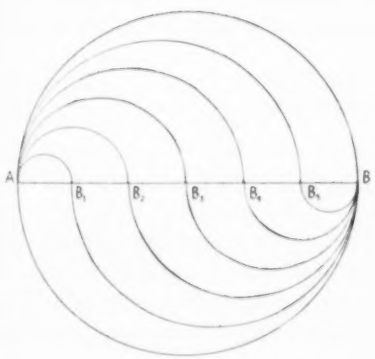

FIG. 1

Construct on AB_1 and B_1B as diameters semicircles so that the semicircle on AB_1 lies above the diameter AB and the semicircle on B_1B lies below the diameter AB.

Let us compute the following areas: the area of the semicircle on AB_1, the area of semicircle on AB, and the area of the semicircle on B_1B. Then we shall add the areas of the semicircles on AB and AB_1 we shall subtract from this sum the area of the semicircle on B_1B.

The area of the semicircle on AB is equal to $\frac{1}{2}\pi r^2$.

The area of the semicircle on AB_1 is equal to $\frac{1}{2}\pi(\frac{1}{6}r)^2$.

The area of the semicircle on B_1B is equal to $\frac{1}{2}\pi(\frac{5}{6}r)^2$.

Adding the first two areas and subtracting the third area we obtain

$$\tfrac{1}{2}\pi r^2(1+\tfrac{1}{36}-\tfrac{25}{36})=\tfrac{1}{6}\pi r^2$$

which is equal to one sixth of the area of the circle.

Construct on AB_2 and B_2B as diameters semicircles so that the semicircle on AB_2 lies above the diameter AB and the semicircle on B_2B lies below the diameter AB.

Let us compute the areas of the semicircles on AB_2 and B_2B. Then we shall add the areas of the semicircles on AB_2 and AB. From this sum we shall subtract the area of the semicircle on B_2B and the area which was computed above (that is, $\frac{1}{6}\pi r^2$).

The area of the semicircle on AB_2 is equal to $\frac{1}{2}\pi(\frac{1}{3}r)^2$.

The area of the semicircle on B_2B is equal to $\frac{1}{2}\pi(\frac{2}{3}r)^2$. We have then

$$\tfrac{1}{2}\pi r^2(1+\tfrac{1}{9}-\tfrac{4}{9}-\tfrac{1}{3})=\tfrac{1}{6}\pi r^2,$$

which is equal to one sixth of the area of the circle.

Construct on AB_3 and B_3B as diameters semicircles so that the semicircle on AB_3 lies above the diameter AB and the semicircle on B_3B lies below the diameter AB.

Let us compute the areas of the semicircles on AB_3 and B_3B. Then we shall add the areas of the semicircles on AB and AB_3. From this sum we shall subtract the area of the semicircle on B_3B and the sum of the two areas which were computed above (that is, twice the area equal to $\frac{1}{6}\pi r^2$, or $\frac{1}{3}\pi r^2$).

The area of the semicircle on AB_3 is equal to $\frac{1}{2}\pi(\frac{1}{2}r)^2$.

The area of the semicircle on B_3B is equal to $\frac{1}{2}\pi(\frac{1}{2}r)^2$. We have then

$$\tfrac{1}{2}\pi r^2(1 + \tfrac{1}{4} - \tfrac{1}{4} - \tfrac{2}{3}) = \tfrac{1}{6}\pi r^2,$$

which is equal to one sixth of the area of the circle.

The computation of the areas of the remaining three portions of the circle is identical with the computations stated above.

The development which is illustrated above may be varied by assigning to n any other values, such as 2, 3, 4, 5, 7, etc.

In a class of intermediate algebra this problem may be generalized so that the computation may be performed for the generalized symbolic treatment as if the division of the area of the circle were required to be performed into n equal parts.

It should be noted that this solution of the division of the area of the circle results in very a interesting design.

Incidentally, the national flag of the Republic of Korea (South) has on its national flag as the main design the division of the area of the circle into two equal parts as shown below.

FIG. 2

The department is still very anxious to know whether the material presented in its column is helpful in your classroom situations. This department is designed to serve and assist the classroom teacher. If you have any questions or comments please send them in. In you have any interesting problem please share them with other members of the National Council.

New Mathematics Kit

A new mathematics kit known as Computation Unit No. 123 has been issued by Science Service in cooperation with the National Council of Teachers of Mathematics. A supply of these has been ordered for the use of readers of THE MATHEMATICS TEACHER. This is the third kit in the series.

The new kit contains materials with which the reader can construct a slide-rule type of device for adding and subtracting signed numbers; a logarithmic slide rule for multiplying, dividing, and the like; and a simplified set of Napier's rods. In addition there is a commercially made plastic slide rule of a type that would cost 50¢ on the market. Also included is an explanatory leaflet which explains simply but in considerable detail both the theory and use of these different instruments. This kit should be useful to both teachers and students.

The supply of the first kit in the series, Geometric Models Unit No. 102 is completely exhausted, and no more orders for it can be filled. There is still a supply available of the second kit, Straight line Unit No. 113. All kits sell for 50¢ each or 3 for $1.00. Your order may be assorted, if you wish, among the 113 and 123 units. Send all orders with payment to the chairman of the kit committee, Professor M. H. Ahrendt, Anderson College, Anderson, Indiana.

What Is Going on in Your School?

By JOHN R. MAYOR
University of Wisconsin, Madison, Wisconsin

SECTION A of a study on trends in teaching mathematics was published in the November, 1950 number of THE MATHEMATICS TEACHER. A summary of replies to the questions in Section A, which was concerned with mathematics enrollments, will be reported in the April issue. This question-answer department is on an experimental basis. It is hoped that this plan will yield information on trends in teaching mathematics useful in study and research in teaching problems. Such a procedure was used with considerable success by the Commission on Post-War Plans. The title given to this section was first used by Raleigh Schorling in reporting on a similar kind of study made by the Commission in the April, 1948 number of THE MATHEMATICS TEACHER. The success of this project depends on the cooperation of the readers of THE MATHEMATICS TEACHER.

The topic chosen for study in Section B is one about which a great many questions are asked. Teachers everywhere are anxious to know what other schools are doing about "general mathematics." As the term is used in the questions below, general mathematics is a course which includes topics from arithmetic, algebra, geometry, and trigonometry, and which is planned as a course to meet the needs of students who may not elect algebra or who may be advised not to elect algebra because of interests, past achievement, or aptitude.

Please send the answers to these questions to John R. Mayor, North Hall, Madison 6, Wisconsin by March 10, 1950. A summary of replies will be published in the May number. We believe that this department can be most effective if replies are sent in promptly and promptly reported.

Readers of THE MATHEMATICS TEACHER are also invited to submit questions for publication in future issues.

In replying please give your name, the name and locality of your school, and your high school enrollment. Also, please indicate the organization of your school such as 4-year high school, grades 9–12; senior high school, grades 10–12; junior high school, grades 7–9; etc. The questions may be answered by numbers without use of a particular form or repetition of the questions. The names of teachers or schools will not be revealed in any of the reports.

B. GENERAL MATHEMATICS

1. Does your school offer both algebra and general mathematics (or a course which might be called general mathematics) in the ninth grade? If not, does your school offer general mathematics in a later grade?
2. What per cent of your students take a course in general mathematics as their first course in high school mathematics (grades 9–12)?
3. For placement of students in general mathematics do you use:
   a. An algebra aptitude test?
   b. An arithmetic achievement test?
   c. The student's grade in eighth grade mathematics?
   d. An intelligence test score?
   e. Written recommendations of teachers?
   f. Other?

   Please indicate which of these or any other placement procedures you use.
4. Upon completion of one year of general mathematics may your students elect:
   a. A second year course in general mathematics?
   b. Algebra?
   c. Plane geometry?
   d. Other courses in mathematics?
   e. None?

   If possible, indicate what per cent of these students enroll in each course.
5. Do the colleges which your graduates attend accept general mathematics on the same basis as they accept a course in algebra?

RESEARCH IN MATHEMATICS EDUCATION

Edited by JOHN J. KINSELLA
School of Education, New York University, New York 3, New York

The Question: What is the place of mathematics in the elementary schools of other countries of the world?

The Study: U.N.E.S.C.O. & International Bureau of Education. *Introduction to Mathematics in Primary Schools.* Geneva, Switzerland, 1950. Six Swiss francs.

Comparisons are not always odious but, on the contrary, often suggestive of new ways of attacking problems. The content and method problems involved in teaching mathematics in the first six grades will probably always be with us. An opportunity to learn what our neighbors in the rest of the world are thinking and doing about these problem would hardly seem to be a waste of time.

Forty-six countries replied to a questionnaire transmitted to them by the Research Division of the International Bureau of Education. This instrument contained eighteen queries about time allotments, content, importance, aims, methods, teaching materials and reforms related to the teaching of elementary mathematics. Some of the more significant results of this investigation follow:

1. *At What Age Does Mathematics Education Begin?*

An introduction to mathematics is given in the first year except in one country. There were ten countries, however, including Belgium, Scotland and Yugoslavia, which had pre-school establishments where some notions of quantity were given at three years of age.

2. *How Much Time Is Given to Mathematics?*

An average of four to six hours a week is assigned. The amount of time is usually the same for each day with the lessons during the first three years being a little shorter or less numerous than in the last three years.

3. *What Are the Aims of Teaching Mathematics during the First Six Years?*

They are, in general, (a) to provide a useful tool and (b) to give a mental discipline. More specifically, they are to acquire a technique, form habits of work, acquire mental attitude, gain knowledge and interest, and to train the intellect.

4. *What Are Some of the Common Elements in the Curricular Pattern?*

(a) The notions about numbers and the operations on them are started early and spread over a period of years instead of being taught in concentrated fashion in a brief period. These early stages involve a considerable use of number in familiar school experiences, games and the manipulation of concrete objects.

(b) Geometry, interpreted as the measurement of magnitude and the study of space and its properties, is of concern from the third year onward. In many countries even the measurement of perimeter, areas and volumes is considered as well as the meaning of angle, parallel and perpendicular. Sequences vary greatly; in some countries teachers begin with the point and the line while in others solids and volumes are given first attention.

5. *What Can Be Said about the Methods of Teaching?*

In addition to providing an experiential base before arriving at the use of numbers in an abstract way teaching aids, readily available without cost in the immediate environment, are brought into the instruction. Some countries believe in the use of projects and incidental teaching while others oppose these procedures because of their interference with the systematic

teaching of mathematics. In one-third of the countries an inductive approach is advocated. By this is apparently meant the discovery of generalizations through experiences with the concrete and specific.

6. *When Are Addition and Subtraction of Whole Numbers Taught?*

The general tendency is to give addition and subtraction exercises on numbers up to ten in the first year, up to twenty in the second year and other important combinations in the third year. Except for three countries no mention is made of addition and subtraction tables. Exercises in putting together and taking apart groups of concrete objects precede the abstract work with numbers. Learning to "carry" is acquired either in the second or third year.

7. *What Are the Limits of the Multiplication Tables?*

These seem to be determined to some extent by the bases used for the system of weights and measures. This may mean twelve in some countries but in India and Pakistan children must learn up to the 16-times table because of the nature of the monetary units.

8. *When Are Fractions and Decimals Taught?*

Practices vary considerably, from teaching addition and subtraction of certain fractions in the first year in Nicaragua and Colombia to the initiation of fractional computations in the third year in Canada and South Africa with the multiplication of a fraction by an integer.

In those countries having the metric system operations on decimals reach a peak in the fourth year while fractions receive their major attention in the fifth and sixth. In the countries not having the metric system it is not unusual to delay the treatment of decimals until the beginning of secondary schooling.

KRAMER, MAX. *Mathematics in Meterology, with Suggestions for Teachers of Mathematics and Meteorology.* Ph.D. dissert. Teachers College, Columbia University. New York. 1949.

This is not only a contribution to the occupational information aspect of guidance but is a source of applications of mathematics to the study of weather, always a matter of interest to all of us.

LETTERS

Exchange Teachers

"I quite agree with Frances Lethlean of Glencoe, Illinois concerning exchange teaching. I tried to promote that locally and the administration countered that temporary replacements are hard to find. I endorse the proposal of a listing in the official organ."

ROSAMUND J. JONES
Ely, Minnesota

"About exchanges! Since they are approved and arranged primarily by School Departments I'm wondering how useful a list would be. Thought it would be interesting to see. *However* what about an article now and then *by* some exchange teacher. These could be *very* helpful, I should think. You could assign general topics or give them free rein! Just what do our visitors think of us? and what do our travelers think of the places they visit?"

MISS FRANCES K. PARRIS
Malden, Massachusetts

A member in Washington, D. C. calls attention to a recent government publication entitled "Teachers Abroad." This bulletin discusses the interchange of teachers between the United Kingdom and the United States since the end of World War II. Published in 1950, it contains 40 pages, costs 20¢, and its catalog number is No. FS5.3:950/10. Send orders to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Order of Operations

"I am troubled by a contradiction in rules found in two algebra texts I have used or am now using. I never knew until this fall that there is no agreement among mathematicians on this subject of 'order of operations.' Surely something should be done about it. Please will you discuss the matter through the magazine, THE MATHEMATICS TEACHER?"

EDITH WOOD
Anchorage, Kentucky

BOOK SECTION

Edited by J. STIPANOWICH

Western Illinois State College, Macomb, Illinois

THIS section presents the latest books which have been received for review in THE MATHEMATICS TEACHER. Reviews of many of these books will appear in the monthly issues. Members of the Council are invited to send us further comments or corrections of errors relating to any of the books mentioned. In addition, a free loan service is available whereby any member may borrow any of the books listed for a period not to exceed two weeks. Requests should be addressed to THE MATHEMATICS TEACHER, 212 Lunt Building, Northwestern University, Evanston, Illinois.

BOOKS RECEIVED

ELEMENTARY SCHOOL

Experimenting With Numbers, Teachers Manual for Use with Beginners, by Catherine Stern, the Castle School, New York. Paper, 105 pages, 1950. Houghton Mifflin Company, 2 Park Street, Boston. $.60.

HIGH SCHOOL

Practical Use of the Slide Rule, College Outline Series, by Calvin C. Bishop. Paper, vii+147 pages, 1950. Barnes and Noble, Inc., 105 Fifth Avenue, New York. $.75.

COLLEGE

Analytic Geometry

An Outline of Analytic Geometry, College Outline Series, by C. O. Oakley, Haverford College. Paper, xviii+246 pages, 1950. Barnes and Noble, Inc., 105 Fifth Avenue, New York. $1.25.

Analytic Geometry and Calculus, by Lyman M. Kells, United States Naval Academy. Cloth, viii+623 pages, 1950. Prentice-Hall, Inc., 70 Fifth Avenue, New York, 11, N. Y. $4.75.

Statistics

Technological Applications of Statistics, by L. H. C. Tippett, Head of the Mechanical Processing Division, British Cotton Industry Research Association. Cloth, ix+189 pages, 1950. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. $3.50.

An Outline of Statistical Methods, Fourth Edition, Revised, College Outline Series, by Herbert Arkin, and Raymond R. Colton, College of the City of New York. Paper, xiii+224 +47 pages, 1950. Barnes and Noble, Inc., 105 Fifth Avenue, New York. $1.50.

Teaching of Mathematics

Measurement and Dimensionality by Aaron Bakst, School of Education, New York University. Paper, ii+70 pages, 1950. New York University Book Store, Washington Square, New York 3, N. Y. $.90.

MISCELLANEOUS

Mathematical Snapshots, Revised, by H. Steinhaus, the University and Polytechnicum Wroclaw, Poland. Cloth, vi+266 pages, 1950. Oxford University Press, 114 Fifth Avenue, New York 11, N. Y. $4.50.

Sourcebook on Atomic Energy, by Samuel Glasstone, Consultant to the United States Atomic Energy Commission. Cloth, 546 pages, 1950. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York 3, N. Y. $2.90.

REVIEWS

Mathematics to Use. Mary A. Potter, Flora M. Dunn, Emmy Huebner Allen, and John S. Goldwaithe. Boston, Ginn and Company, 1950. ix+500 pp., $2.40.

Mathematics to Use is intended primarily for the ninth grade but could be very helpful in courses in general mathematics at various high school levels. The authors have established the validity of the topics in the text by checking them with the Check List compiled by the Commission on Post-War Plans of The National Council of Teachers of Mathematics.

Arithmetic is emphasized throughout the book, but important topics from algebra and geometry are to be found. Special emphasis is placed on the simple equation so that the student may adequately manipulate the formula. The geometry presented is informal in nature. It is particularly noteworthy that the social applications of mathematics are stressed throughout the text.—WILLIAM H. NAULT, W. K. Kellogg Junior High School, Battle Creek, Michigan.

Fundamental Algebra with Practical Applications. Robert L. Erickson. New York. McGraw-Hill Book Company, 1949. xi+317 pp., $2.80.

This text, designed for a basic mathematics course which "reviews and integrates the fundamentals of arithmetic . . . and . . . algebra," is a radical departure from the conventional treatment of elementary mathematics—the arrangement of the material and the author's style being unique.

The first four chapters include a thorough treatment of the arithmetic of signed numbers. The remainder of the text treats of topics from elementary algebra and a brief introduction to trigonometry. The author avoids as much as

possible the presentation of formal rules and formulas, but relies on the student's reasoning ability. The book contains an enormous number of exercises, a large proportion of which are of a very practical nature.

Many teachers will find this a valuable source of material to supplement other textbooks. The book seems best adopted for vocationl courses, but might well be considered for use in courses in general mathematics.—H. D. LARSEN, Albion College, Albion, Michigan.

Arithmetical View Points: An Introduction to Mathematical Thinking. Sidney G. Hacker. Pullman, Washington, The State College of Washington, 1948. vii+144 pp.

The titles of these six lectures suggest their content: "The Art of Reckoning," "Mechanical Counting Devices," "Certain of the Foundations of Arithmetic," "Some Celebrated Theorems of Arithmetic," "The Rational Numbers," and "The Irrational Numbers." Starred subtitles in the Table of Contents indicate sections that might be omitted by "readers of limited mathematical experience." All illustrations are grouped into a single section at the end of the book.

These lectures were planned as a part of a course on Physical Sciences at the State College of Washington when time did not permit an entire course on the Mathematical Sciences. They are introductory in nature and some proofs are omitted; where such omissions are made, ample references are made (in Notes at the end of Chapter VI) to places where proofs may be found.

Although much of the material offered is not new, it is a departure from many "introductions to mathematics" in two respects: (1) the inclusion of some theorems not usually presented, and (2) in the content of the chapter on mechanical counting devices.—ELINOR B. FLAGG, Illinois State Normal University, Normal, Illinois.

Dynamic Plane Geometry. David Skolnik, with the editorial assistance of Miles C. Hartley. New York, D. Van Nostrand Company, Inc., 1950. xii+289 pp., $2.56.

The authors define *dynamic* geometry as "a study of the parts of space and their relation to one another while they are in motion and changing." They combine in this text the best of the traditional course in geometry with much that is new. The purpose is not only to make the subject more meaningful and understandable to the student, but also to aid him in clear thinking in other life situations.

Part One develops the meaning of proof. The first chapters give very clear explanations and varied applications of fundamental assumptions and definitions, followed by a thorough development of the meaning of a theorem. Congruent triangles are introduced only after an extensive study of geometric concepts and methods. Part One concludes with a study of constructions and quadrilaterals.

Part Two, called "Patterns of Thinking," is devoted to the development of different types of dynamic thinking through the study of the circle, area, proportion, similar triangles, and functional relationships in the triangle. The appendix contains a section on inequalities, a summary of fundamental theories, tables, and lesson plans.

Nearly all of the pages of this attractive, well-bound book have double columns of large print. It contains almost one thousand excellently drawn figures and twelve hundred exercises which are grouped into three levels of difficulty. The unusual arrangement of subject matter, the great number of theorems postulated, and the emphasis given to the application of clear thinking in other fields of knowledge are outstanding features of this book. These characteristics, along with the carefully worked out and gradual approach to sound reasoning, make it a very usable and purposeful text for the beginner in geometry.—DOROTHY RIDGWAY, Central High School, Fort Wayne, Indiana.

College Algebra. Harry A. Bender. New York, Pitman Publishing Corporation, 1950. xi+451 pp., $3.50.

The author states in the preface that it is his purpose to write a textbook which is self-directive as far as possible and also one in which the techniques used and the materials presented will be such as to develop the student's power of analysis as well as his algebraic skills. A careful study of the book would seem to indicate that the author has succeeded in these purposes to a large extent.

All conventional topics are included with exercises of sufficient difficulty to develop the student's skills and to challenge his ability as well. Historical accounts which lend interest to the topics are included with the material to which they refer. Review material is adequate (sixty pages of fundamental algebraic processes).

Unusual features of the book are: (1) A short discussion of our number system, (2) A discussion of functions and their graphs with the concept of slope and simple derivatives included, (3) the use of determinants for the solution of systems of linear equations is introduced early, and (4) systems of equations involving quadratics are delayed until Chapter XIII.

The physical make up of the text is such that it is very legible.

In the opinion of the reviewer this is one of the better college algebra texts and deserves careful consideration by those persons teaching the subject.—HERBERT HANNON, Western Michigan College of Education, Kalamazoo, Michigan.

NEWS NOTES

A Geometry Teaching Institute, sponsored by The School of Education with the cooperation of the Department of Mathematics was held at the University of Michigan on Saturday, January 13, 1951. An audience and panel discussion included brief reports from Josephine Montague of Central Michigan College of Education, Dorothy Noyes of Ann Arbor High School, Clara Mueller of Cass Technical High School in Detroit, Howard F. Beatty of Saginaw High School and Harold Fawcett of Ohio State University. Discussion and laboratory groups met in the morning and afternoon and were led by Russell Schneider of Lansing Eastern High School, Donald Marshall of Dearborn High School, Norman Anning of the University of Michigan, Gertrude Pratt of Central Michigan College of Education, Kenneth Leisenring of the University of Michigan and Lauren Woodby of the University High School. The principal address was delivered in the afternoon by Professor Fawcett and was entitled "The Interplay of Induction and Deduction in the Teaching of Geometry."

The Fourth Conference of Mathematics Teachers at the University of Virginia will be held February 23 and 24, 1951. Principal speakers and Forum Leaders include Professor John R. Clark of Columbia University, Z. T. Kyle of the Virginia State Department of Education, H. W. Charlesworth of the National Council of Teachers of Mathematics and Veryl Schult of Washington. Round table discussions will be led by Louise D. Rice of the Andrew Lewis High School, W. L. Lord, of the Woodberry Forest School, and Theodore Gibson of Roanoke College.

Dr. Donovan A. Johnson of the University of Minnesota will conduct a Workshop for Teachers of Mathematics at the University of Colorado during the first term of the summer session of 1951, from June 18th to July 20th. This Workshop will provide an opportunity for mathematics teachers to specialize in areas in which they have individual needs and interests.
